Stability Analysis for Promising Yellow Maize Hybrids under Different Locations

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Received on:8/10/2013 *Accepted: 8/12/2013*

ABSTRACT

Grain yield, stability for the new promising maize hybrids is an important target in breeding programs. The main objective of this study was identify the stable superior hybrids for grain yield under different locations. Twenty six promising yellow three way crosses, in addition to two cheek hybrids, i.e. TWC 352 and TWC353 were evaluated at five locations i.e. Sakha (Sk), Gemmeza (Gm), Sids (Sd), Nubaria (Nub) and Mallawy (Mal) Agricultural Research Stations in 2011 summer growing season.

Highly significant differences among hybrids for all studied traits were detected in the combined analysis across locations. Variances due to locations and hybrids x locations interaction were highly significant for all studied traits. Linear and non linear components were significant or highly significant for all studied traits.

Four three way crosses, i .e. SC 162 x Sk 5002/36, SC 162 x Sk 5001/1, SC 162 x Sk 5003/61 and SC 162 x Sk 4021/12 were stable for grain yield, which had high mean the grand mean, not significant for both regression coefficient and deviation from regression compared with unity and zero, respectively and high coefficient of determination, in addition to superior than two checks. This study suggest use these hybrids in maize breeding program.

Key words: Maize

INTRODUCTION

In the contemporary agriculture, the man is not interested in the genotype that will adjust well to the given agro- ecological conditions in order to continue the species, but in the genotype with high yielding potential and at the same time with the good stability and adaptability.

Hybrid adaptability across diverse environments is usually tested by its interaction with different environments. Genotype is considered to be more adapted or stable if it has a high mean yield and low fluctuated in yielding ability across diverse environments. There are two possible strategies for developing low G x E interaction cultivars. The first is subdivision or stratification of a heterogeneous area into smaller, more homogenous sub-regions, with breeding programs aimed at developing cultivars for specific sub-regions. However, even with this refinement, the level of interaction can remain high because breeding area does not reduce the interaction of cultivars with locations through years. The second strategy for reducing G x E interaction involves selecting cultivars with better stability across a wide range of environments in order to better predict behavior (Eberhart and Russell 1966, Tai 1971).The variety with a high mean, regression coefficient close to unity ($b_i = 1$) and the deviations from regression as small as possible ($S^2d_i = 0$) was stable (Eberhart and Russell 1966). Jensen and Cavalieri (1983) found that the correlation between yield and b value of the regression over the environmental index was negative but the correlation was relatively low. Tollenaar and Lee (2002) showed that high yielding maize hybrids can differ in yield stability, but results do not support the contention that yield stability and high grain yield are mutually exclusive. Lee et al (2003) stated that grain yield stability can be improved through recurrent selection by selecting solely for mean performance across multiple environments. Shehata et al (2005) constructed an index which combined the mean yield and two parameters of stability, i.e. b_i and $S^2_{y.x}$ of the regression of variety mean on environmental index and it was designated as a superiority index. They reported that a superiority index could be used in estimating the degree of desirability for the different hybrids. Mosa et al (2012) found that genotype x environment (G x E) interaction and their partitions, E (linear), G x E (linear) and pooled deviations (non- linear) were significant for grain yield. They added that the coefficient of determination (R^2) values ranged from 0.58 to 0.91for grain yield.

The objective of this study was to estimate degree of stability for some promising hybrids for number of days to 50% silking, plant height and high grain yield under different environments.

MATERIALS AND METHODS

Twenty six yellow three way crosses, i.e. Sc-166 x Sd-3118, Sc-166 x Sd-3120, Sc-166 x Sd-3123, Sc-162 x Sk-5002/33, Sc-162 x Sk-5002/34, Sc-166 x Sk-5002/34, Sc-166 x Sk-5002/35, Sc-162 x Sk-5002/36, Sc-162 x Sk-5002/48, Sc-166 x Sk-5002/48, Sc-162 x Sk-5001/1, Sc-162 x Sk-5001/4, Sc-162 x Sk-5001/7, Sc-162 x Sk-5001/9, Sc-162 x Sk-5003/56, Sc-162 x Sk-5003/60, Sc-162 x Sk-5004/61, Sc-162 x Sk-5005/68, Sc-162 x Sk-4020/2, Sc-162 x Sk-4021/3, Sc-162 x Sk-4021/6, Sc-162 x Sk-4021/7, Sc-162 x Sk-4021/9, Sc-162 x Sk-4021/10, Sc-162 x Sk-4021/11 and Sc-162 x Sk-4021/12 resulted from Maize Breeding Program at Sids and Sakha (Sk). Agricultural Research Stations in 2010 growing season. These twenty six hybrids, in addition to two commercial hybrids, i.e. TWC352 and TWC 353 were evaluated in five locations i.e. Sakha (Sk), Gemmeza (Gm), Sids (Sd), Nubaria (Nub) and Mallawy (Mal) Agricultural Research Stations in 2011 summer growing season. The mechanical and chemical analysis of soil for experimental sites are presented in Table(1). Air and soil temperature was recorded for May, June, July, August and September are presented in Table(2). A randomized complete block design with four replications was used at each location. Plot size consisted of four rows, 6m long, 0.8 m apart and 0.25m between hills. Two kernels were planted per hill and the plants were thinned to one plant/hill before the first irrigation. Nitrogen fertilizer, at the rate of 120 kg N/fed was splited into two equal doses applied before the first and second irrigation as Urea form. Phosphorus and Potassium fertilizers were added at the rate of 30 kg P_2O_5 and 24 kg K_2O /fed, respectively, for all plots before planting irrigation. All recommended agricultural practices were followed through the growing season. Data were taken for number of days to 50% silking , plant height and grain yield ard./fed. (1 ardab = 140 kg , 1 feddan= 4200m^2) adjusted to 15.5% moisture content. Statistical analysis at each location was done according to Steel and Torrie (1980). Bartlett (1937) test was used to test the homogeneity of error mean squares. In case of homogeneity, combined analysis of variance across locations was done. Stability analysis across, the five locations was performed according to Eberhart and Russell (1966). Estimate coefficient of determination (R^2) according to (Pinthus 1973).

RESULTS AND DISCUSSION

Analysis of variance of days to 50%silking, plant height and grain yield for the 28 hybrids across the five locations is presented in Table (3). Differences among the locations were found to be highly significant for the three studied traits, indicating that the five locations were different in their environmental conditions.

Table 1: Physical and chemical properties of soil samples before experiment in 2011 growing season.

Location	Sakha (Sk)	Gemmeza (Gm)	Sids (Sd)	Nubaria (Nub)	Mallawy (Mall)
		Physical properties			
Coarse Sand %	6.14	2.8	1.5	2.9	1.3
Fine sand %	18.04	23.1	14.7	51.0	20.3
Silt	25.7	23.07	32.1	20.8	27.4
Clay	50.12	51.03	51.7	25.3	51.0
Texture	Clay	Clay	Clay	Sandy clay leom	Clay
		Chemical properties			
Available N ppm	59.3	48.0	43.0	26.3	53.1
Available p ppm	9.5	11.6	10.5	9.7	10.7
Available k ppm	290	290.3	275.3	425.0	263.3
PH	7.7	8.00	7.8	8.3	7.7
EC (dS/m-2)	1.4	0.93	0.48	2.21	0.52

Table 2: Normal monthly climatic data at the five locations during growing periods of maize in 2011 growing season.

Month		May	June	July	August	September
Air Temperature(°C) (average)	Sakha (Sk)	24.0	25.4	27.6	26.7	24.7
	Gemmeza(Gm)	24.8	26.6	28.4	27.6	25.6
	Sids (Sd)	24.6	27.6	29.0	28.2	26.4
	Nubaria (Nub)	23.6	25.8	27.6	26.4	23.4
	Malawy (Mall)	24.2	28.0	29.6	28.6	26.7
Soil Temperature(°C)	Sakha (Sk)	23.5	24.8	27.2	27.5	25.2
	Gemmeza(Gm)	23.5	25.6	27.3	27.5	25.4
	Sids (Sd)	24.0	27.8	27.2	28.5	25.8
	Nubaria (Nub)	23.0	24.6	26.5	27.0	24.2
	Malawy (Mall)	24.7	28.6	27.1	29.5	25.8

Table 3:Combined analysis of variance for 28 maize hybrids across five environments.

SOV	d.f	Mean of squares		
		Days to 50% silking	Plant height (cm)	Grain yield (ard./ fed.)
Environments (E)	4	1204.431**	60681.627**	1837.027**
Rep/E (error a)	15	9.643	1242.243	33.792
Hybrids (H)	27	34.646**	1657.24**	35.204**
H x E.	108	5.459**	326.313**	31.044**
Pooled error (error b)	405	1.614	143.771	8.036

** significant at 0.01 level of probability

Highly significant differences among hybrids were detected for all studied traits, also, the interaction between environments and hybrids (E x H) was highly significant for all studied traits, meaning that the behavior of these hybrids markedly differed from one location to another, suggesting marked differences between the five environments in their climatic and soil condition. In this respect, Comstock and Moll (1963) defined the genotype x environment interaction as the differential response of phenotype to the change in environment, also, Eberhart and Russell (1966) and Freeman and Perkins(1971) demonstrated that the main cause of differences among genotypes in their yield stability trails were the wide occurrence of genotype x environment interaction. Similar results agreement with Ragheb et al.(1993), Mosa et al. (2009), Abdallah et al.(2011) and Mosa et al.(2012).

Estimates of means for number days to 50% silking, plant height and grain yield at five locations in 2011 season are presented in Table (4). The results exhibited that, The lowest number of days to 50% silking was obtained at Gemmeza and Mallawy locations, as will as Sakha location which produced the highest mean for grain yield also Sakha and Gemmeza locations were produced high means for plant height. While, Sids and Nubaria locations were produced the lowest means for all studied traits except for days to 50% silking. Fery (1964) and Fery and Maldonado (1967) defined the stressed environment as the non in which mean performance for a certain attribute is low and that stress for one trait does not mean stress for all traits under study.

Mean performance of the twenty six promising three way crosses and two checks across the five environments for the studied traits is presented in Table (5). For days to 50% silking, eight hybrids *i.e.* SC166 x Sd 318, SC 166 x Sd 3120, SC 166 x Sd 3123, SC 166 x Sk 5002/34, SC 162 x Sk 5002/48, SC 166 x Sk 5002/48, SC 162 x Sk 5003/56 and SC 162 x Sk 5003/60 were significantly earlier than the best check hybrids (TWC353). Concerning plant height, the hybrids SC 166 x Sd3123 and SC 166 x Sk 5002/34 were statistically equalled the best check hybrids (TWC352). For grain yield, the results exhibited that all hybrids were not significantly out yielded compare to the check TWC353.

Analysis of variance for days to 50% silking, plant height and grain yield stability parameters for the 28 hybrids across locations is presented in Table (6). Hybrids significantly differ for all studied traits. Hybrids x locations interaction component was further partitioned into linear (hybrids x locations) and non linear (pooled deviation) components. Mean squares for both of these components were tested against pooled error mean square. The linear and non linear components were highly significant for all studied traits except linear for grain yield was significant,indicating that the linear (predictable) and non linear (unpredictable) components shared with hybrids x locations interaction. Also significant linear component means that the tested hybrids did not similarly respond to the varied locations, while significant pooled deviation, means that the deviation of all hybrids from linearity was significant. These results are in agreement with conclusions reached by Lee *et al* (2003), Rasul *et al* (2005), El- Sherbieny *et al* (2008), Mosa *et al* (2009), Abdallah *et al* (2011) and Mosa *et al* (2012).

Table 4: Average number of days to 50% silking, plant height and grain yield resulted in the five locations.

Environment (location)	Means		
	Days to 50% silking	Plant height (cm)	Grain yield (ard./ fed.)
Sakha	61.31b	275.47a	33.49a
Gemmeza	60.19a	269.30a	28.92b
Sids	66.47c	225.40c	23.81c
Nubaria	66.66c	226.83c	23.86c
Mallawy	60.38a	246.50b	28.52b

Table 5: Mean performance of twenty six promising and two check hybrids for three traits as an average across the five environments.

Hybrids	Days to 50% silking	Plant height (cm)	Grain yield (ard./ fed.)
SC166 x Sd 318	61.55	241.25	28.89
SC 166 x Sd 3120	61.60	237.3	28.42
SC 166 x Sd 3123	61.85	235.1	25.45
SC 162 x Sk 5002/33	63.05	258.4	27.83
SC 162 x Sk 5002/34	62.85	245.8	28.40
SC 166 x Sk 5002/34	61.70	235.9	26.91
SC 166 x Sk 5002/35	62.85	243.1	28.09
SC 162 x Sk 5002/36	62.35	263.2	29.60
SC 162 x Sk 5002/48	61.25	247.4	27.99
SC 166 x Sk 5002/48	61.10	238.9	28.04
SC 162 x Sk 5001/1	63.00	268.6	28.51
SC 162 x Sk 5001/4	64.70	264.8	26.66
SC 162 x Sk 5001/7	63.00	252.2	29.84
SC 162 x Sk 5001/9	63.80	259.2	28.26
SC 162 x Sk 5003/56	60.90	248.2	27.91
SC 162 x Sk 5003/60	60.30	241.8	26.83
SC 162 x Sk 5003/61	64.30	255.6	28.47
SC 162 x Sk 5005/68	63.60	241.9	28.54
SC 162 x Sk 4020/2	65.00	246.6	26.23
SC 162 x Sk 4021/3	64.55	254.0	26.25
SC 162 x Sk 4021/6	63.45	252.9	28.11
SC 162 x Sk 4021/7	64.70	247.9	25.88
SC 162 x Sk 4021/9	64.65	256.8	27.65
SC 162 x Sk 4021/10	63.50	248.4	27.49
SC 162 x Sk 4021/11	63.55	254.7	28.97
SC 162 x Sk 4021/12	64.50	243.3	28.62
TWC 352	63.25	236.1	23.71
TWC 353	62.75	244.6	28.37
C.V%	2.02	4.82	10.23
L.S.D 0.05	0.787	7.43	1.757

Estimates of stability parameters for number of 50% silking, plant height and grain yield (ard/fed) for 28 hybrids across five locations are presented in Tables (7 and 8). The genotype that had low mean number of days 50% silking, plant height and higher mean for grain yield mean than the grand mean, unit regression coefficient equal to the unity (b_i =1) and small deviation from regression (S^2d_i =0) is stable (Eberhart and Russel 1966) with high coefficient of determination(R^2) according to (Pinthus 1973).

For days to 50% silking, two promising three way crosses were stable, i.e. TWC SC162 x SK 5002/34 ($\bar{x}$ = 62.85, b_i = 0.894, S^2d_i = 0.202 and R^2 = 99.29%) and TWC SC162 x SK 5003/56 ($\bar{x}$ = 60.9, b_i = 0.874, S^2d_i = 2.232 and R^2were 92.55%). For plant height, seven promising three way crosses were stable, i.e. TWC SC166 x Sd 3120 ($\bar{x}$ = 237.3, b_i = 1.158, S^2d_i = 35.65, and R^2 = 92.40%), TWC SC162 x Sk 5002/34 ($\bar{x}$ = 245.8, b_i = 0.818, S^2d_i = -21.50 and R^2 = 97.10%), TWC SC162 x Sk 5002/48 ($\bar{x}$ = 247.0, b_i = 1.166, S^2d_i = 53.25 and R^2 = 91.68%), TWC SC162 x Sk 5003/56 ($\bar{x}$ = 248.2, b_i = 0.915, S^2d_i= 54.83 and R^2 = 86.96%), TWC SC162 x Sk 5003/60 ($\bar{x}$ = 240.7, b_i = 1.052, S^2d_i = 22.40 and R^2 = 92.55%), TWC SC162 x Sk 4021/7 ($\bar{x}$= 247.2, b_i = 0.983, S^2d_i = 42.87 and R^2 = 89.86%), TWC SC162 x Sk 4021/10 ($\bar{x}$ = 248.3, b_i = 0.957, S^2d_i = -24.45 and R^2 = 98.29%). For grain yield, five promising three way crosses were stable, i.e. TWC SC 162 x Sk 5002/36($\bar{x}$ = 29.60,b_i = 0.867, S^2d_i = 0.599 R^2 = 86.33%), TWC SC 162 x Sk 5001/1 ($\bar{x}$ = 29.60, b_i = 1.186, S^2d_i = -0.766 ,R^2 = 96.11%), TWC SC 162 x Sk 5003/61 ($\bar{x}$ = 28.47,b_i = 1.163, S^2d_i = -0.255, R^2 = 94.40%),TWC SC 162 x SK 4021/6 ($\bar{x}$ = 28.31, b_i = 1.066, S^2d_i = 2.223, R^2 =85.43%) and TWC SC 162 x SK 4021/12 ($\bar{x}$ = 28.62,b_i = 0.795, S^2d_i = 1.267, R^2 = 80.84%).

Table 6: Stability analysis of variance for 28 hybrids evaluated at five different locations.

S. O. V.	d.f	Days to 50% silking	Plant height (cm)	Grain yield (ard./fed.)
Hybrids	27	8.6614**	414.31**	8.801 **
E + (H x E)	112	12.06**	620.4649**	23.885**
Linear	1	1204.431**	60681.627**	1837.027**
H x L (linear)	27	2.54**	87.74**	10.676*
Pooled deviation	84	0.938**	76.49**	6.57**
SC166 x sd 318	3	0.472	104.421*	7.46*
SC 166 x sd 3120	3	0.694	73.249	2.63
SC 166 x sd 3123	3	0.202	268.768**	3.42
SC 162 x SK 5002/33	3	0.273	63.042	7.19*
SC 162 x SK 5002/34	3	0.081	14.442	6.26*
SC 166 x SK 5002/34	3	1.256*	103.770*	13.40**
SC 166 x SK 5002/35	3	0.668	35.220	8.45**
SC 162 x SK 5002/36	3	2.509**	93.294	2.60
SC 162 x SK 5002/48	3	1.794**	89.19	12.59**
SC 166 x SK 5002/48	3	1.131*	36.346	7.22*
SC 162 x SK 5001/1	3	0.285	172.961**	1.24
SC 162 x SK 5001/4	3	0.567	34.294	6.41*
SC 162 x SK 5001/7	3	0.443	27.473	6.95*
SC 162 x SK 5001/9	3	1.449*	76.899	3.22
SC 162 x SK 5003/56	3	0.900	90.780	1.61
SC 162 x SK 5003/60	3	0.548	58.352	23.70**
SC 162 x SK 5003/61	3	0.946	80.726	1.75
SC 162 x SK 5005/68	3	2.941**	78.199	10.07**
SC 162 x SK 4020/2	3	0.397	29.694	7.33*
SC 162 x SK 4021/3	3	1.422*	70.245	3.90
SC 162 x SK 4021/6	3	0.070	76.023	4.242
SC 162 x SK 4021/7	3	1.461*	87.82	1.71
SC 162 x SK 4021/9	3	1.580**	96.396*	4.46
SC 162 x SK 4021/10	3	1.811**	11.489	1.83
SC 162 x SK 4021/11	3	0.445	70.922	11.34**
SC 162 x SK 4021/12	3	1.030	48.783	3.27
TWC352	3	0.102	148.645**	12.10**
TWC353	3	0.769	9.168	7.63*
Pooled error	420	0.403	35.94	2.009

*,** significant at 0.05 and 0.01 levels of probability, respectively

Vargas *et al* (1999) reported that, multi-environment trials play an important role in selecting the best cultivars to be used in future years at different locations and in assessing cultivar stability across environments before its commercial release. Carvalho *et al* (2000) stated that the hybrids that gave coefficient of determination (R^2) more than 80% had good production stability in all of the environments .Tollenaar and Lee (2002) found that stability analysis showed that high yielding maize hybrid can differ in yield stability, but results did not support the contention that yield stability and high grain yield are mutually exclusive. This study refered that TWC SC 162 x SK 5002/36, TWC SC 162 x SK 5001/1, TWC SC 162 x SK 5003/61 and TWC SC 162 x SK 4021/12 to be released as new commercial three way crosses, because they showed stable grain yield under varying environments and superior than two checks.

Table 7: Stability parameters for days to 50% silking and plant height for 28 hybrids under five different locations.

hybrid	Days to 50% silking				Plant height (cm)			
	$\bar{x}$	bi	S^2di	R^2	$\bar{x}$	bi	S^2di	R^2
SC166 x SD 318	61.55	0.845*	1.171	95.59	241.2	1.282*	66.83*	91.92
SC 166 x SD 3120	61.60	0.826*	1.720	93.37	237.3	1.158	35.65	92.97
SC 166 x SD 3123	61.85	0.834*	0.501	98.01	235.6	1.123	232.82**	77.24
SC 162 x SK 5002/33	63.05	0.867	0.679	97.52	258.3	0.976	27.09	91.61
SC 162 x SK 5002/34	62.85	0.894	0.202	99.29	245.8	0.818	-21.50	97.10
SC 166 x SK 5002/34	61.70	1.075	3.115*	92.95	235.9	0.877	67.82*	84.26
SC 166 x SK 5002/35	62.85	0.757*	1.657	92.48	243.0	0.743*	-0.72	91.90
SC 162 x SK 5002/36	62.35	0.731*	6.220**	75.37	263.2	0.591*	57.35	73.06
SC 162 x SK 5002/48	61.25	0.815*	4.447**	84.16	247.0	1.166	53.25	91.68
SC 166 x SK 5002/48	61.10	0.821*	2.804*	89.54	238.8	1.226*	0.40	96.76
SC 162 x SK 5001/1	63.30	0.975	0.707	97.95	268.6	0.846	137.01**	74.96
SC 162 x SK 5001/4	64.70	0.936	1.406	95.68	264.7	0.873	-1.64	94.14
SC 162 x SK 5001/7	63.20	0.984	1.098	96.91	252.1	0.823	-8.46	94.68
SC 162 x SK 5001/9	63.80	0.738*	3.592*	84.35	258.6	0.734*	40.95	83.51
SC 162 x SK 5003/56	60.90	0.874	2.232	92.40	248.2	0.915	54.83	86.96
SC 162 x SK 5003/60	60.30	0.770*	1.359	93.94	240.7	1.052	22.40	92.55
SC 162 x SK 5003/61	64.30	1.290*	2.345	96.18	255.6	1.044	44.78	90.70
SC 162 x SK 5005/68	63.60	1.407*	7.292**	90.61	241.9	1.271*	42.25	93.72
SC 162 x SK 4020/2	65.00	1.213*	0.985	98.15	248.7	0.629*	-6.24	90.61
SC 162 x SK 4021/3	64.55	1.074	3.525*	92.08	254.0	0.988	34.30	90.95
SC 162 x SK 4021/6	63.45	0.919	0.174	99.42	252.8	1.137	40.08	92.47
SC 162 x SK 4021/7	64.70	1.164*	3.622*	93.00	247.2	0.983	42.87	89.86
SC 162 x SK 4021/9	64.65	1.195*	3.918**	92.83	256.7	0.864	60.45*	84.84
SC 162 x SK 4021/10	63.50	0.946	4.490**	87.64	248.3	0.957	-24.45	98.29
SC 162 x SK 4021/11	63.55	0.877	1.104	96.11	254.7	1.152	34.97	93.11
SC 162 x SK 4021/12	64.50	1.204*	2.553	95.28	243.3	1.233*	12.84	95.75
TWC352	63.25	1.572*	0.254	99.71	236.1	1.344*	112.70**	89.77
TWC353	62.75	1.465*	1.908	97.56	244.6	1.216*	-26.77	99.14
X	63.01				248.7			

Table 8: Stability parameters for grain yield (ard./fed) for 28 hybrids under five different locations.

hybrid	Grain yield (ard./Fed.)			
	$\bar{x}$	bi	S^2di	R^2
SC166 x SD 318	28.89	0.757	5.452*	62.72
SC 166 x SD 3120	28.42	0.449*	0.624	62.65
SC 166 x SD 3123	25.45	1.437*	1.417	92.95
SC 162 x SK 5002/33	27.83	0.976	5.185*	74.3
SC 162 x SK 5002/34	28.40	0.697	4.254*	62.93
SC 166 x SK 5002/34	26.91	0.420*	11.391**	22.40
SC 166 x SK 5002/35	28.09	0.702	6.447**	56.09
SC 162 x SK 5002/36	29.60	0.867	0.599	86.33
SC 162 x SK 5002/48	27.99	1.123	10.588**	68.66
SC 166 x SK 5002/48	28.04	0.563*	5.214*	48.97
SC 162 x SK 5001/1	28.51	1.186	-0.766	96.11
SC 162 x SK 5001/4	26.66	1.401*	4.401*	87.01
SC 162 x SK 5001/7	29.84	0.622*	4.949*	54.93
SC 162 x SK 5001/9	28.26	1.431*	1.218	93.27
SC 162 x SK 5003/56	27.91	0.390*	-0.389	67.31
SC 162 x SK 5003/60	26.83	0.694	21.69**	30.78
SC 162 x SK 5003/61	28.47	1.163	-0.255	94.40
SC 162 x SK 5005/68	28.54	1.462*	8.064**	82.28
SC 162 x SK 4020/2	26.23	1.200	5.322*	81.13
SC 162 x SK 4021/3	26.25	1.253	1.894	89.80
SC 162 x SK 4021/6	28.31	1.066	2.223	85.43
SC 162 x SK 4021/7	25.88	1.599*	-0.294	97.02
SC 162 x SK 4021/9	27.65	2.050*	2.460	95.36
SC 162 x SK 4021/10	27.49	1.076	-0.174	93.24
SC 162 x SK 4021/11	28.97	0.607*	9.334**	41.55
SC 162 x SK 4021/12	28.62	0.795	1.267	80.84
TWC352	23.71	0.830	10.097**	55.50
TWC353	28.37	1.188	5.623*	80.18
X	27.71			

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الملخص العربى

تحليل الثبات الوراثى لبعض هجن الذرة الشامية الصفراء المبشرة تحت مواقع مختلفة

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مركز البحوث الزراعية- معهد بحوث المحاصيل – قسم بحوث الذرة الشامية

ثبات صفة محصول الحبوب لهجن الذرة الشامية المبشرة الجديدة من الأهداف المهمة في برامج التربية. ويهدف هذا البحث إلى التعرف على الهجن المتفوقة والثابتة في صفة محصول الحبوب فى المواقع المختلفة. حيث تم تقييم ستة وعشرون هجين ثلاثي أصفر من الهجن المبشرة الجديدة بالإضافة إلى اثنان من هجن المقارنة هما (هـ.ث٣٥٢ وهـ.ث٣٥٣) في خمس مواقع مختلفة بمحطات بحوث سخا والجميزة وسدس وملوى والنوبارية في موسم ٢٠١١.

أظهر التحليل المشترك عبر المواقع الخمس وجود اختلافات عالية المعنوية بين الهجن، وأيضا كانت الاختلافات بين المواقع والتفاعل بين المواقع والهجن عالية المعنوية لكل الصفات المدروسة، كما كانت مكونات التفاعل الخطى وغير الخطى معنوية أو عالية المعنوية لكل الصفات المدروسة.

أظهرت النتائج ثبات أربعة هجن لصفة محصول الحبوب و هي هـ.ف ١٦٢ x سلالة سخا ٣٦/٥٠٠٢، هـ.ف ١٦٢ x سلالة سخا ١/٥٠٠١، هـ.ف ١٦٢ x سلالة سخا ٦١/٥٠٠٣، هـ.ف ١٦٢ x سلالة سخا ١٢/٤٠٢١ والتي كانت ذات متوسط عالي وانحدار خطى وخطأ قياسي غير معنوي مقارنة بالوحدة والصفر على الترتيب ومعامل تقدير عالي بالإضافة إلى تفوق هذه الهجن الأربعة على هجيني المقارنة. توصى هذه الدراسة باستخدام هذه الهجن الأربعة في برامج تربية الذرة الشامية.