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Selection of yield and its components in bread wheat under old and new land conditions in Upper Egypt

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ABSTRACT

Improving wheat's tolerance to environmental stress is of utmost importance in the current era due to climatic changes. This study was carried out to determine the relative merits of pedigree selection for grain yield per plant on old and new land. To quantify the response of selection, two cycles of pedigree selection for grain yield per plant were applied to a segregating population of bread wheat crosses (Misr 3 Line #1) in F3 and F4 generations under new land stress conditions. The F5-selected families were evaluated in both old and new land habitats after the second cycle. Under both circumstances, the genotypic variance was much less than the phenotypic variance, and it generally decreased from the F3-generation to the F5-generation. Furthermore, compared to the old land environment, broad-sense heritability estimates for grain yield plant-1 were lower in the new land environment. After Cycle 1 and Cycle 2, the realized heritability in old land was 52.03 and 84.52 percent, respectively, compared to 34.08 and 62.80 percent in new land. In both cases, the instant reaction to selection that was found on ancient soil was examined, and the results showed a significant increase in grain production from both the bulk and the best parent of 5.40 and 5.02 percent and 17.28 and 7.03 percent, respectively. Selected families for grain yield under new land that were studied under both conditions revealed negligible increases of 12.29 and 2.80 percent from the bulk and considerable increases of 28.24 and 22.34 percent from the better parent, under new and old land, respectively. The results indicate these genotypes could be used as sources of tolerance or factors contributing to general adaptation. Furthermore, selection for grain yield/plant under new land stress was superior to selection under old land stress, regardless of whether selection entries were evaluated under stress or non-stress.

Keywords: Wheat, *Triticum aestivum*, new land, Selection, Stress susceptibility index.

INTRODUCTION

Heat frequency is gradually increasing around the world. Most crops will be subject to heat stress at various times of their life cycles as a result of this temperature rise. With a total cultivation area of 2.14 million km2 and a global production of 761 million tons, wheat feeds more than 35% of the world's population (FAO, 2021). Because Egypt has a limited amount of cultivated land, the government launched a significant project to recover 1.5 million feddans to ensure the food security of the expanding population. Due to a 45 percent disparity between production and consumption, wheat is regarded as the most significant crop and is given top priority in state policy. (FAO, 2021). Especially for wheat and other crops, newly recovered areas will play a significant role in demonstrating food security for the population. In order to decrease wheat imports and preserve foreign currency, increasing wheat production becomes a crucial national goal Mohiy *et al*. (2021). Selection is one of the main traits used in plant breeding. A component of successful plant breeding is the identification of superior species with a limited or wide range of genetic variation. The significant phenotypic and genetic coefficients of variation seen for the majority of the yield and its components, evaluated in wheat genotypes, are markers for their wide range of variability, according to Zeeshan *et al*. (2014), Desheva and Cholakov (2015), Khan *et al*. (2015), and Salous (2017). The phenotypic coefficients for variance values (PCV) being close to the genotypic coefficients for variance values (GCV) indicates the traits that are most successfully selected for and those that are least affected by the environment. Heritability estimations offer details on the quantitative features' transmission indices and are crucial for a successful crop breeding strategy. The magnitude of heritability also assists in anticipating the behavior of future generations by eliciting proper selection criteria and analyzing the extent of genetic progress. Low to high estimates of the heritability and genetic development of wheat grain yield were published by Abinasa *et al*. (2011), Moustafa (2015), and Nassar (2020).

Stress susceptibility index (SSI) is a major stress factor where stresses limit crop production in most areas of the world especially in new reclaimed lands. Increasing yields in dry locations must develop crop cultivars with high yield potential through the identification of drought tolerance mechanisms (Fischer and Maurer, 1978; Rajaram *et al*. 1996). When analyzing plant resilience, it's vital to take stress intensity and duration into account. All agronomic parameters, particularly grain yield, are decreased by heat stress when it lasts for a long time. A one-day heat stress event, however, has been shown to significantly reduce grain production and its constituent parts Salous *et al*. (2014), Sharaan *et al*. (2017) and Shenoda *et al*.(2021).

The present study aims to develop bread wheat varieties with high yielding characteristics under new land conditions in Upper Egypt. The objective of this study was to estimate the response to selection in the wheat population in newly reclaimed lands and assess a population of bread wheat (*Triticum aestivum* L.), which is segregating, the associated response in grain yield and its components, as well as the effectiveness of pedigree selection for grain yield, are studied.

MATERIALS AND METHODS

Sites, Plant Materials and Experimental Design:

The present study was conducted in two locations in Upper Egypt. The 1st site was new reclaimed sandy soil, Tomas (Luxor) and the 2nd site was El-Mattana Agric. Res. Sta., (ARC), Ministry of Agric, Egypt, during 2018/2019, 2019/2020 and 2020/2021 growing seasons. The population used in this study was F_3 population originated from the cross between Misr $_3$ × Line#1. The local cultivar (Misr 3) of bread wheat is more adapted in Egypt and has high yielding ability; however, (line#1) is characterized by its tolerance to environmental stresses and high yielding. Therefore, this line was crossed with the Egyptian cultivar to enlarge the variability for selection in the breeding program for the heading date, yield and its component. The pedigree and origin of the two parents are presented in Table 1. Two cycles of pedigree selection were achieved under new and old land conditions, and evaluated under both environments.

Table 1. Pedigree of the two parental wheat genotypes.

Parents	Pedigree	Origin
(P_1) Misr 3	ATTILA*2/PBW65*2/KACHU CMSS06Y00582T099TOPM-099Y099ZTM 099Y099M-10WGY-0B0-0EGY.	**EGYPT**
(P_2) Line#1	ATTILA 50Y//ATTILA/BCN/3/STAR*3/MUSK-3 AISBW05-0043-10AP-0AP-0AP-7AP-0AP-OSD	**ICARDA**

Two field experiments (F3 generation): were conducted in the 2018–2019 growing season to assess F3 families chosen from the population in a randomized complete block design with three replicates on both the old and new lands. A pooled random sample of 100 F3 families, parents, and a mixture of an equal number of seeds from each plant served as the representation of each generation in each experiment.

In the next season 2019/2020 (F_4 generation) To assess the F4 families chosen from each group at both the old and new sites, two field experiments were conducted. The top 10 high-yielding families were determined at the end of the growing season, and the best plant from each was saved.

In season 2020/2021 (F_5-generation): the 10 high-yielding families, the parents and the largest sample selected for each treatment, were evaluated in both settings in two separate trials.

Measurements:

The mean of the ten plants was estimated for the F3, F4, and F5 generations based on data obtained from ten guarded plants per row from each family. The following traits were examined: number of spikes/plant (S/P), number of kernels/spike (K/S), 1000-kernel weight (1000-KW) in g, and grain yield/plant (GY/P) in g. The data were subjected to suitable statistical analysis) Steel and Torrie 1980). The Revised Least Significant Differences (RLSD) method was used to compare genotype means (Gomez and Gomez, 1984). Calculated were heritability in the broadest sense (H), genetic variance (g), and phenotypic variances (ph, g) (Walker, 1960). Falconer (1989) computed the realized heritability (h2 = R / S), where R stands for response to selection and S for selection difference. The coefficients of variation for phenotype (pcv%) and genotype (gcv%) were calculated (Burton, 1952). Calculation of the stress sensitivity index (SSI) (Fischer and Maurer, 1978). The chosen line's sensitivity and comparative benefits were assessed (Falconer, 1990).

RESULTS

Traits Variability and Heritability in the F_3 Generation:

Table (2) provides information on the mean and range values, the least significant difference, the phenotypic and genotypic coefficients of variance, and heritability in the broad sense for the traits examined in the F3 generation. There are considerable variances between the highest and lowest values of the assessed attributes, compared to the least significant difference, which suggests the possibility of large changes being achieved by selection. The PCV% and GCV% for grain yield and its components in old and new land were high (more than 10%) for phenotypic and genotypic coefficient variance. The coefficient of phenotypic variance was somewhat higher than the coefficient of genetic variance for all of these traits. Despite this, the magnitude of differences between the two was low for all traits.

Heritability was high for all traits under study in F_3-population**.** The reduction caused by New land in the F_3-population was 17.23, 25.22, 22.61 and 26.67% for number of spikes/plant, kernels/spike, 1000-kernel weight and grain yield/plant, respectively. Similar results were found by El-Morshidy *et al*. (2010) and Soliman *et al*. (2014). Salous (2017) noted that the average reduction caused by heat stress was 39.57, 24.31, 25.14 and 21.44; for number of spikes/plant, number of kernels/spike, 1000 kernel weight and grain yield/plant, respectively.

Table 2. The examined traits of the F3 generation were measured for mean and range values, least significant difference (LSD5 %), phenotypic (P.C.V %) and genotypic (G.C.V %), coefficients of variation, and broad sense heritability (h2bs).

Item	Old Land				New Land			
	S/P	K/S	1000-KW	GY/P	S/P	K/S	1000-KW	GY/P
Mean ±S.E	9.17 ±4.66	53.21 ±18.85	39.94 ±17.13	31.08 ±13.46	7.59 ±4.62	39.79 ±22.11	30.91 ±16.9	22.79 ±15.89
Range	6.0 – 12.0	45.0-65.6	28.2-51.6	17.4-42.7	4.6-10.3	29.0-53.6	21.3-42.1	8.8-37.8
LSD5%	1.33	5.35	4.87	3.82	1.30	6.28	4.77	4.52
P.C.V%	14.40	11.17	16.50	25.88	20.04	12.93	20.82	35.93
G.C.V%	13.45	10.58	15.90	25.50	19.07	11.65	19.98	35.20
h^2bs	87.26	89.74	93.10	97.14	90.58	81.14	92.63	96.15
Reduction%					17.23	25.22	22.61	26.67

Mean squares, phenotypic, genotypic coefficients of variability and heritability estimates:

Mean squares of the pedigree families for the studied traits in F_3, F4 and F_5 generations are shown in Table 3. The families' mean squares for all studied traits were highly significant for the two cycles under the old and new land conditions. This indicates that there is genetic variation between families for further selection of grain yield/plant.

Table 3. Mean squares of pedigree families F_3, F_4 and F_5 generations for all studied traits in old and new land.

Generation	Environment	S.O.V	D.F	Mean Squares			
				No. of spikes/ plant	No. of kernels/ spike	1000- kernel weight	Grain yield/ plant
F3	old Land	Rep	2	2.68	149.62	15.28	143.28
		Families	99	5.23**	106.03**	130.37**	194.07**
		Error	198	0.66	10.87	8.98	5.55
	new Land	Rep	2	0.65	241.13	135.12	109.62
		Families	99	0.34	79.41*	122.30**	201.19**
		Error	198	0.65	14.97	8.76	7.74
F4	old Land	Rep	2	0.21	95.55	76.90	80.48
		Families	19	5.15**	179.81**	33.87**	23.29**
		Error	38	0.77	33.39	4.11	3.40
	new Land	Rep	2	3.26	292.21	115.01	29.76
		Families	19	1.65**	95.37*	14.94**	15.19**
		Error	38	0.37	17.31	3.08	2.94
F5	old Land	Rep	2	0.03	3.63	39.82	46.12
		Families	9	2.21**	38.33*	6.07*	7.98**
		Error	18	0.66	10.81	2.21	1.39
	new Land	Rep	2	0.93	67.63	62.08	12.67
		Families	9	1.27**	16.83*	5.73*	6.35**
		Error	18	0.34	5.07	2.06	1.07

*, ** Significant at 5% and 1% respectively.

The variability of the selection criterion (grain yield per plant) was rapidly reduced after the first cycle of pedigree selection (GYP). It had a high PCV (more than 10%), with old land accounting for 25.88% and new land for 35.23% in the F3 generation and decreasing to 7.95, 8.87%, and 4.41, 5.90% in old and new land after C1 and C2, respectively (Table 4). Similarly, the pcv% under the new land was slightly higher than that under the old land and showed the same trend; this could be due to the higher average grain yield under the old land compared to the new land. GCV was also high (more than 10%), at 25.51% in the old lands and 35.23% in the new lands in F3 generation, and decreased to 7.35, 7.96%, and 3.88, 5.01% in the old and new lands after C1 and C2, respectively. The gcv percentage was slightly lower than the pcv percentage in both environments and decreased from C1 and C2, which is normal due to increasing homozygosity and decreasing heterozygosity in the selected families. In the two cycles of selection, very high estimates of broad-sense heritability were produced by high estimates of phenotypic and genetic variability. The huge mean squares of the families in comparison to the modest error variance was another factor contributing to the extremely high heritability estimations. Realized heritability was high for grain yield per plant: 52.03 and 84.52 under old land and 34.08 and 62.80 under new land after generations C1 and C2, respectively. These results confirmed the predictions suggested by the correlation coefficients between generations and the regression analysis between parent and offspring

Table 4. Phenotypic (σ2 p), genotypic(σ2 g) coefficients of variability and heritability (H) in a broad sense of the selected families for grain yield per plant after two cycles of selection under old and new land conditions .

Selection cycle	σ2 p		σ2 g		P.C.V. %		G.C.V. %		H %		Realized heritability%	
	old Land	new Land	old Land	new Land	old Land	new Land	old Land	new Land	old Land	new Land	old Land	new Land
F_3 families	64.69	67.07	62.84	64.49	25.88	35.93	25.51	35.23	97.14	96.15		
F_4 families	7.77	5.06	6.63	4.08	7.95	8.87	7.35	7.96	85.40	80.59	52.03	34.08
F_5 families	2.66	2.12	2.06	1.53	4.41	5.90	3.88	5.01	77.55	72.22	84.52	62.80

Means and Observed Selection Gain under Old Land Evaluation:

In Table 5, the means of the two groups of families chosen for high grain yield/plant across two cycles, either under new or old land conditions, were assessed for both locations.

With an average of 33.39 g/plant, the group of families chosen under ancient land had grain yields per plant ranging from 28.32 for family No. 34 to 36.31 for family No. 39. The observed mean direct gain from selection resulted in a non-significant (P0.01) 5.40 percent deviation from the bulk sample and a 17.28 % deviation from the better parent. Additionally, increases from the better parent ranged from 14.40 % for family No. 31 to 27.54 percent for family No. 39 for seven chosen families that exhibited significant gains (P0.01). Five of them had gains from the bulk sample that were statistically and significantly significant. Family No. 15 experienced a significant observed rise in grain yield/plant from the bulk sample that varied from 10.04 % to 14.61 %.

Family numbers varied from 34.98 for family No. 18 to 39.93 for family No. 44, with an average of 37.00 g/plant. A group of households was chosen under new land and analyzed under old land. The estimated mean direct gain from considerably (P0.01) selected increased by 12.29 % in the bulk sample and by 28.24 % in the better parent. Additionally, nine of the selected families had considerable and highly significant benefits compared to the bulk sample, with gains from the better parent ranging from 21.25 % for family number 18 to 38.41 percent for family number 44. The significant observed rise in grain yield/plant from the bulk sample varied from 7.28% for family No. 1 to 21.18% for family No. 44.

Table 5. Average grain yield/plant and observed gain from the bulk sample (OG % "Bulk") and the best parent (OG % "BP") of the selected families following two cycles of selection under old and new Land.

Item	Fam. No.	Evaluation under old Land			Evaluation under new Land		
		Mean	OG%Bulk	OG% BP	Mean	OG%Bulk	OG% BP
Selection under old Land	3	35.13	10.89*	23.39**	22.03	5.77	3.97
	5	30.27	4.45	6.32	23.79	1.75	3.71
	12	31.59	0.28	10.96	26.45	13.13**	15.30**
	15	34.86	10.04*	22.44**	25.37	8.51	10.59*
	24	34.68	9.47	21.81**	25.51	9.11	11.20*
	31	32.57	2.81	14.40*	23.41	0.13	2.05
	34	28.32	10.61**	0.53	23.5	0.51	2.44
	39	36.31	14.61**	27.54**	24.82	6.16	8.20
	43	35.13	10.89*	23.39**	25.63	9.62**	11.73**
	48	35.05	10.64*	23.11**	25.02	7.01	9.07
	Mean	33.39	5.40	17.28	24.55	5.02	7.03
	Misr 3	28.47			22.94		
	Line#1	25.38			21.31		
	Bulk	31.68			23.38		
R.LSD0.05		3.64			2.27		
R.LSD0.01		4.98			3.12		
Selection under new Land	1	35.35	7.28*	22.53**	27.40	1.29	20.55**
	9	37.11	12.63**	28.63**	29.76	10.02*	30.93**
	10	35.71	8.38*	23.78**	25.98	3.96	14.30**
	14	35.89	8.92*	24.40**	28.52	5.43	25.47**
	18	34.98	6.16	21.25**	24.98	7.65*	9.90*
	23	37.24	13.02**	29.08**	28.73	6.21	26.40**
	25	38.74	17.57**	34.28**	29.53	9.17*	29.92**
	36	36.52	10.83**	26.59**	26.46	2.18	16.41**
	40	38.51	16.87**	33.48**	28.06	3.73	23.45**
	44	39.93	21.18**	38.41**	28.66	5.95	26.09**
	Mean	37.00	12.29**	28.24**	27.90	2.80	22.34**
	Misr 3	28.85			22.73		
	Line#1	26.52			21.63		
	Bulk	32.95			27.05		
R.LSD0.t05		2.29			2.11		
R.LSD0.01		3.14			2.89		

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

Means and Observed Selection Gain under New Land Evaluation:

A group of selected families with high grain yield for two cycles under old land and evaluated under new land ranged from 22.03 for family No. 3 to 26.45 for family No. 12, with an average of 24.55 g/plant. The bulk sample's average growth and the better parent's average gain were 5.02 and 7.03 percent, respectively. For families Nos. 12 and 43, respectively, two selected families substantially observed gains from the bulk sample of 13.13 and 9.62 percent. The observed gains from the better parent were significant in four of these families and ranged from 10.59 for family number 15 to 15.30 for family number 12. The means of the group of families were selected under a new land and evaluated under a new land for the high grain yield per plant for two cycles; they ranged from 24.98 for family No. 18 to 29.76 for family No. 9, with an average of 27.90 g/plant. The bulk sample and the superior parent both showed an average gain under the new law of 2.80 and 22.34 percent, respectively. All three selected families showed significant gains (P 0.01); the observed gain from the better parent ranged from 9.90% for family number 18 to 30.93% for family number 9. Three selected families significantly gained from the bulk sample: 7.65, 9.17, and 10.02 percent for family's numbers 18, 25, and 9, respectively.

Average observed gain from selection for grain yield/plant in the two cycles:

The observed means and benefits through selection to create a high grain yield/plant are shown in Table 6. In C0 and C1, respectively, the observed gain from selection for greater grain yield/plant was 15.41 and 21.37 %, while under new land it was 17.78 and 17.07 % from the better parent. The F5-generation's selection for grain yield/plant under new land was more successful, as can be shown from these findings. This could be attributed to the F5 generation's higher homozygosity levels, which allowed for the identification of genotypes with superior genetic makeup. As a result, as was already said, the findings of these materials indicate that, to save money and time, grain yield and plant selection should be postponed until F5-generation.

The observed increase in grain yield for the chosen family on the older land and the evaluation on both the older and newer land was, respectively, 17.28 and 7.03 % from the better parent. On the other hand, for the families who were chosen under new land and evaluated under new and normal land, respectively, these gains were 28.24 and 22.34 %.

Table 6. Mean and observed gain from selection for grain yield/p under old and new land from the bulk sample and the better parent.

Cycle and means	**old Land**		**new Land**	
Base Pop.(C_0):2018/2019 **Families mean**	**31.08**		**22.79**	
Misr 3	26.93		19.35	
Line.1	25.13		18.34	
Bulk sample	28.49		21.13	
OG % (Bulk)	9.09		7.86	
OG %(Better parent)	15.41*		17.78*	
R. L.S.D. 0.05	**3.82**		**5.51**	
R. L.S.D. 0.01	**5.07**		**5.99**	
Cycle 1: 2019/2020 **Families mean**	35.04		25.38	
Misr 3	28.87		21.68	
Line.1	27.25		20.87	
Bulk sample	31.12		23.69	
OG % (Bulk)	12.60**		7.13	
OG %(Better parent)	21.37**		17.07**	
R. L.S.D. 0.05	**3.01**		**2.81**	
R. L.S.D. 0.01	**3.92**		**3.65**	
Cycle 2: 2020/2021	**Fam. old land**	**Fam. new Land**	**Fam. old land**	**Fam. new Land**
Families mean	33.39	37.00	24.55	27.90
Misr 3	28.47	28.85	22.94	22.73
Line.1	25.38	26.52	21.31	21.63
Bulk sample	31.68	32.95	23.38	27.05
OG % (Bulk)	5.40	12.29**	5.02	2.80
OG %(Better parent)	17.28**	28.24**	7.03	22.34**
R. L.S.D. 0.05	**3.64**	**2.29**	**2.27**	**2.11**
R. L.S.D. 0.01	**4.98**	**3.14**	**3.12**	**2.89**

*and ** are significant at the likelihood levels of 0.05 and 0.01, respectively.
OG% (Bulk) = Observed gain in percentage of the bulk sample.
OG% (Bp) = Observed gain in percentage of the best sample.

Mean, stress susceptibility index (SSI), sensitivity and reduction:

Table (7) displays the F5-generation's stress susceptibility index, environmental sensitivity, and correlation coefficients. Three of the families, nos. 5, 12, and 34, had stress susceptibility index (SSI) values less than one, according to the results for families chosen for two cycles on old land and evaluated under both sites, and similarly, in the new land, the assessment at both sites also indicated that the five families no. 1, 9 14, 23 and 25 gave stress susceptibility index (SSI) values less than one.

Table 7. Mean grain/plant yield, stress susceptibility index (SSI) and sensitivity under old and new land environments in F5-generations.

Item	Fam. No.	GY/P (old land)	GY/P (new land)	SSI	Sensitivity	Reduction
Old Land	3	35.13	22.03	1.41	1.48	37.29
	5	30.27	23.79	0.81	0.73	21.41
	12	31.59	26.45	0.61	0.58	16.27
	15	34.86	25.37	1.03	1.07	27.22
	24	34.68	25.51	1.00	1.04	26.44
	31	32.57	23.41	1.06	1.04	28.12
	34	28.32	23.5	0.64	0.55	17.02
	39	36.31	24.82	1.20	1.30	31.64
	43	35.13	25.63	1.02	1.07	27.04
	48	35.05	25.02	1.08	1.13	28.62
	Average	33.39	24.55		1	26.11
New Land	1	35.35	27.4	0.91	0.87	22.49
	9	37.11	29.76	0.79	0.78	19.81
	10	35.71	25.98	1.09	1.04	27.25
	14	35.89	28.52	0.82	0.78	20.53
	18	34.98	24.98	1.14	1.06	28.59
	23	37.24	28.73	0.91	0.91	22.85
	25	38.74	29.53	0.95	0.98	23.77
	36	36.52	26.46	1.10	1.07	27.55
	40	38.51	28.06	1.08	1.11	27.14
	44	39.93	28.66	1.12	1.20	28.22
	Average	37.00	27.90		0.98	24.82

DISCUSSION

Because of the variation in phenotypic and genotypic coefficients, the PCV and GCV percent of grain yield and its components were high (more than 10%) in an old and new land, PCV percent and GCV percent can be considered low (10%), medium (10-20%), and high (>20%). For all of these qualities, the coefficient of phenotypic variance was slightly larger than the coefficient of genetic variance. This indicated that the influence of environmental factors on genotype-phenotype expression was limited and that there was a large chance for enhancement of these traits by selection based on genotype phenotypic performance. Heritability is an important parameter for implementing an effective optimization strategy. Selection of a single plant may be more effective for a highly heritable trait; moreover, the environment may also interact with the genetic makeup to influence heritability. The other cause of very high estimates of heritability was the large mean squares of families compared to a small error variance. This could be attributed to evaluating the selected families on new land for one season (Salous, 2017; Patel *et al*., 2019; Nassar, 2020). These results are in agreement with those of Mahdy (2012), Laala *et al*. (2017), and Salous (2017), who noted that realized heritability was high for grain yield (66.73 and 82.21) under normal irrigation and (37.79 and 59.63) under drought irrigation after C1 and C2, respectively. These outcomes supported the hypotheses raised by the analyses of the parent-offspring regressions and the intergenerational correlation coefficients.

This result showed that selection for these qualities in these families may be advantageous in both the direct (under new land) and indirect (old land) environments. Overall, selecting a high-producing plant on new land was superior to selecting a high-yielding plant on old land. In other words, anti-selection was superior to synergistic selection for grain yield (Mahdy *et al.,* 2012). According to Salous *et al.* (2014), the gains from two cycles of selection for grain yield accounted for 45.00 and 61.53 % of the increases from the bulk sample and better parent, respectively. These findings suggested that families chosen under conventional or novel situations were evaluated under the same conditions (Soliman *et al*., 2014; Nassar 2020).

These results show that selection for high grain yield from the F5 generation was more effective in both conditions than selection from the F3 and F4 generations. This could be because the F5 generation had a higher level of homozygosity, making it easier to detect the genetically superior genotypes. These findings suggested that using pedigree selection after two cycles to improve yield and its constituent attributes was helpful in isolating high-yielding genotypes under new land conditions. Similar results were in line with those obtained by Rasha, M. (2012), Mohiy (2015), and Salous (2017). These families are less likely to experience stress.

CONCLUSION

The results suggest that these genotypes can be used as sources of tolerance or factors that contribute to general adaptation. Moreover, selection for grain yield/plant under stress conditions of the new land was better than selection under non-stress conditions in the old land, regardless of whether selections were evaluated under stress or without stress.

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الانتخاب للمحصول ومكوناته فى قمح الخبز تحت ظروف الاراضى القديمة والجديدة بمصر العليا

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يعتبر تحسين القمح لتحمل الاجهاد البيئى ذا أهمية قصوى فى العصر الحالى بسبب التغييرات المناخية ولهذا أجري البحث لدراسة الميزة النسبية للانتخاب المنسب لمحصول الحبوب للنبات تحت ظروف الاراضى القديمة والاراضى المستصلحة حديثا بمصر العليا . تم تنفيذ دورتين للانتخاب المنسب لمحصول الحبوب فى عشيرة من قمح الخبز ناتجة من تهجين (مصر 3 × سلالة1) في البيئتين ، فى الجيل الثالث والرابع تحت ظروف الاراضى القديمة والاراضى الجديدة لتقدير الاستجابة للانتخاب. وفي الجيل الخامس تم تقييم منتخبات الارض القديمة والارض الجديدة تحت ظروف البيئتين. وكان مقدار التباين الوراثي أقل قليلا من التباين المظهري تحت ظروف البيئتين وانخفض عموماً تدريجيا من الجيل الثالث إلى الجيل الخامس. وكانت قيم معامل التوريث بالمعنى الواسع لمحصول الحبوب / نبات فى الاراضى الجديدة أقل من التى تم الحصول عليها فى الاراضى القديمة. كان معامل التوريث المحقق عاليا تحت ظروف الاراضى القديمة (52.03 و 84.52 %) مقابل (34.08 و 62.80 %) تحت ظروف الاراضى الجديدة للدورة الأولي والثانية علي التوالى . وقد أظهرت التراكيب الوراثية المنتخبة تحت ظروف الارض القديمة (التي جرى تقييمها تحت ظروف الارض القديمة والجديدة) فروقا معنوية عاليه في محصول الحبوب للنبات بالنسبة لبلك العشيره بمقدار 5.40% و 5.02% و بمقدار 17.28 و 7.03 % بالنسبة للأب الأفضل على التوالي ولكن العائلات المنتخبه لمحصول الحبوب العالي تحت ظروف الاراضى الجديدة (والتي جرى تقييمها تحت ظروف الارض القديمة والجديدة) أظهرت المنتخبات فيها زيادة معنويه لمحصول الحبوب بمقدار12.29 و 2.80% بالنسبة لبلك العشيره و بمقدار28.24 و 22.34% بالنسبة للأب الأفضل تحت ظروف الاراضى القديمة والجديدة على الترتيب. وتشير هذه النتائج إلي أن الانتخاب المضاد يقلل الحساسية فى الارض الجديدة أما الانتخاب المتوافق فيزيد الحساسية للارض الجديدة. علاوة على ذلك كان الانتخاب لمحصول الحبوب للنبات تحت ظروف الاراضى الجديدة أفضل من الانتخاب تحت ظروف الارض القديمة سواء أجري التقييم تحت ظروف الارض القديمة أو تحت ظروف الارض الجديدة.

الكلمات الافتتاحية : القمح ، قمح الخبز ، الاراضى الجديدة ، الانتخاب ، دليل الحساسية للاجهاد