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GIZA 2000, A NEW EGYPTIAN BARLEY VARIETY FOR NEWLY RECLAIMED LANDS AND RAINFED AREAS

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ABSTRACT: This study indicates the development and improving the characteristics of Giza 2000, a superior new barley variety for the newly reclaimed lands and rainfed areas at the North Coast region. I t was produced from a cross between the local variety Giza-121 and the line 366/13/1 which was made in 1978/1979 season. In developing this variety, the check cultivars Giza 123, Giza 124, Giza 125 and Giza 126 were compared with Giza 2000 and two promising lines as well as the regional check Rihane-03. For this purpose, 39 yield trials were conducted from 1998/1999 to 2001/2002 growing season under rainfed conditions as well as under newly reclaimed lands.

The average yield of the new cultivar Giza 2000 recorded 3.51 ardab/feddan and significantly outyielded Giza 126 under rainfed conditions with an average increase of 0.57 ardab/feddan, i.e. 19.39%. In the newly reclaimed lands, the average yield of the new cultivar Giza 2000 significantly exceeded the average of national check Giza 123 by 2.46 ardab/feddan (17.25%). The new variety combines the good characteristics of its parents which including high yield ability, moderate resistance to leaf rust and resistance to powdery mildew and net blotch. Molecular fingerprinting utilizing PCR with 38 random 10mer primers was done for the new variety and preserve the breeder's rights. A number of 115 reproducible are repeatable bands were recovered during PCR. Usefulness of this environment-independent molecular approach was discussed.

Key words: New barley cultivar, Giza 2000, yield, yield stability, fingerprint.

INTRODUCTION

Barley is the main crop grown in a large scale in North Coast of Egypt. It is ,also, the main crop in the newly reclaimed land and in soils with chemical problems (saline soils) or where the irrigation water is limited. The total area of barley, in Egypt, fluctuated year after year according to the amount and distribution of rainfall. The barley cultivated area in the Nile valley has decreased, especially at locations where soil and irrigation is suitable for growing other strategic crops, such as wheat. On the other hand, the barley area has increased in the newly reclaimed lands under different irrigation systems. The harvest area reached 99.356 hectare in 2001/2002. Barely yields have increased gradually over the past 50 years from 2.53 in the sixties to 2.98 ton/ha in 2000/2001 season. The increase in barley productivity was mainly due to the release of improved barley varieties, which started when the varieties Sahrawy, Bonus, Giza 117 and Giza 118 were released in 1955, 1956, 1958 and 1963, respectively. All these varieties were resistance to the main barley diseases and characterized by high yielding ability. Later on, crossing work was further intensified by the introduction of useful resources, consequently, Giza 119, Giza 121, CC 89, and CC 163 were developed in 1973, 1975, 1977 and 1977, respectively. It should be clearly started that breeding work achieved forward step in the past 15 years by releasing the varieties Giza 123 (for soil salinity and new reclaimed area), Giza 124 (for heat stress), Giza 125, and Giza 126 (for drought stress condition). These varieties were characterized by their high yielding ability and exhibited good performance under different environmental stresses.

Most progress in cultivar identification, so far, has achieved only on a phenotypic analysis of a genotype, i.e. morphological characteristics that require extensive observations of individuals (Wigley *et al.*, 1987). Factors like the environment, multigenic and quantitative inheritance as well as degree of dominance; partial and complete dominance that virtually affect gene expression. However, DNA-based genetic markers have been extensively integrated into several plant systems and are expected to play a very important role in the future of molecular genetics and plant breeding. Over the last decade, the revolution of polymerase chain reaction (PCR) technology has been initiated as a novel genetic assay based on selective DNA amplification (Saiki *et al*., 1988; Krawets, 1989; Innis *et al*., 1990). This assay depend on the enzymatic amplification of small DNA fragments using single arbitrary olignucleotide primers (usually 10 mers) for cultivar identification.

The present research work represents the procedures followed in developing the new barley variety Giza 2000, which was characterized by its wide adaptability and its high yielding ability under different environmental conditions

MATERIALS AND METHODS

During 1969/1970 growing season, the cross between Giza 117 and Bahteem 52 was performed at Giza Agric. Res. Center. In the same season, another cross was made between Giza 118 and FAO 86. These two crosses were crossed together in 1970/1971 and produced the cross Giza 117/Bahteem 52//Giza 118/FAO 86. The purpose of this cross was to combine the good characteristics of the four parents. i.e. early maturing, moderate resistance to leaf rust and net blotch barley diseases and high yielding ability. The cross Giza 117/ Bahteem 52//Giza 118/FAO 86 was crossed with the local cultivar Giza 121 at Giza Agricultural Research Station, Egypt in 1978/1979 winter growing season. The segregating material was handled according to the pedigree method at Giza and Sakha Research Stations where it was exposed to severe natural infection of leaf rust and net blotch.

The cross L 366/13/1 * Giza 121 i.e. (Giza 117/ Bahteem 52//Giza 118/FAO 86*Giza 121) was compared along with promising material in early yield trials. As a result of these micro trials, the cross was promoted for further evaluation in Advanced Yield Trials compared with the commercial varieties (Giza 123, Giza 124, Giza 125 and Giza 126) along with Rihane-03 (long term regional check cultivar) and two promising lines (Table 1-a). For this purpose, a series of 39, i.e. 15 and 24 yield trials were conducted, under rainfed conditions and newly reclaimed lands, respectively, in a randomized complete block design with 3 replications during the period from 1998/1999 to 2001/2002. Agricultural practices for barley were applied as recommended in each region.

Statistical analysis of data obtained was made using the methods outlined by Gomez and Gomez (1984). The stability parameters suggested by Eberhart and Russel (1966) were estimated for grain yield of the tested genotypes over all years and locations under study. One stability parameter was estimated as the linear regression coefficient (*b*) of a genotype mean on the average of all genotypes in the particular environment. The other stability parameter was deviation from regression S^2d for each genotype and mean performance.

Table (1-a): Over environment pedigree of the testes genotypes.

Genotype	Pedigree	Origin
Rihane 'S'	Long term check variety introduced from ICARDA	ICARDA
Giza 123	Giza 117/FAO 86	Egypt
Giza 124	Giza 117/Bahteem 52//Giza 118/FAO 86	Egypt
Giza 125	Sister line to Giza 124	Egypt
Giza 126	Baladi Bahteem/SD 729-Por 12762-BC	Egypt
Line 1	(Giza 121 x Chaaran-01/Deir Alla 106/3/Asse/Aths//Apm)	Egypt
Line 2	(MAF 102/Yolla//WW319 x Giza 119)	Egypt
Giza 2000	Giza 117/Bahteem 52//Giza 118/FAO 86*Giza 121	Egypt

Rainfall distribution at rainfed sites of the study are shown in (Table 1-b). The values of rainfall at Raffah were interpolates from Al-Arish rainfall figures according to the Climatological Normals.

Table (1-b): Monthly and seasonal rainfall distribution at three rainfed sites* during the period from 1999/2000 to 2001/2002 season.

Month	Monthly Rainfall (mm)								
	El-Mathani (NWC)			El-Negela (NWC)			Raffah (N. Sinai)**		
	99/00	00/01	01/02	99/00	00/01	01/02	99/00	00/01	01/02
Nov.	21.8	38.35	N.A.	16.6	48.00	N.A.	N.A.	N.A.	21.6
Dec.	5.95	48.03	N.A.	8.1	47.45	N.A.	N.A.	N.A.	29.4
Jan.	104.15	70.75	N.A.	105.9	9.00	N.A.	N.A.	N.A.	170.8
Feb.	23.7	15.20	N.A.	30.3	11.20	N.A.	N.A.	N.A.	35.1
March	8.75	3.85	N.A.	7.7	0.80	N.A.	N.A.	N.A.	37.6
Apr.	-	-	-	-	-	-	-	-	-
Seasonal RF/mm	**164.35**	**176.18**	**N.A.**	**168.6**	**118.45**	**N.A.**	**N.A.**	**N.A.**	**301.7**

* **Rainfall data of El-Mathani and El-Negela at Northwest Coast were received from Matrouh Management Project, meanwhile, those of Raffah were interpolated from Al-Arish figures according to the Climatological Normals.**

** **Raffah and El-Goura are closed areas.**

DNA isolation:

Leaf sample from 7- days-old seedling of the tested genotype, Giza 2000 was collected from five guarded plants to saturate polymorphism within the variety and instantly frozen in liquid nitrogen. DNA was extracted from 0.5 g of fresh tissue buy the modified procedure of Gawel and Jarrett (1991). DNA concentration was measured by UV-spectrophotometer at a wavelength of 260 nm.

PCR conditions:

Thirty eight arbitrary 10 mer primers (primers A04, B01, B05, B06. B07. B08, B10, B11, B12, B13. B14. B15, B16, B18, C01, C05. C08. C10, C19, D07, D09, D10, D20. E07, E09, E19, O02, O05. O09. O10, O12, o18, O20, Z08. Z10. Z11 and Z13 from Operon Technologies Inc., Alameda. CA 94501) were used for PCR based on the protocol of Williams *et al.*, (1990). The reaction conditions were optimized and mixtures (37.5 μl total volume) consisted of 10 mM tris-HCL. P^H 8.8 at 25^0C, 50 mM KCl, 1.5 mM mgCl2, nucleotides dATP, dCTP. dGTP, and TTP (0.2 mM each). 0.2 μM primer, 50 ng template DNA and 1.5 units of Taq DNA polymerase (Promega). Amplifications were carried out in a thermocycler (Berkin Elmer) programmed for 37 cycles of 45 sec at 94^0C, 50 sec at 36^0C, 1 min at 72^0C and ended with 8 min at 72^0C.

Gel electrophoresis:

Agarose (1.2%) gel electrophoresis was used in this study according to Bahieldin and Ahmed (1994). A 1 kb plus DNA ladder was used as a standard. The run was performed for one hour at 100 V in Pharmacia submarine (20 cm X 20 cm). Bands were detected, scored for molecular weights and photographed by Gel Documentation System. PCR was reported twice for each primer and products that were generated at least twice were considered reproducible, while those generated only once were considered artifacts and eliminated from the fingerprint. Band sizes less than 100 or over 5000 bp were also eliminated from the fingerprint that are usually unrepeatable.

RESULTS AND DISCUSSION

Mean performance of grain yield under rainfed conditions:

A series of 15 yield trials were conducted at Marsa Matrouh (El-Mathani and El-Negela), North Sinai (El-Goura and Raffah) and Sakha 1999/2000 and El-Noubaria 2000/2001 and 2001/2002 (irrigated only once at sowing time) under rainfed conditions during the period of 1999/2000 to 2001/2002 to evaluate seven barley cultivars checks, lines and the released variety. Drought is the main environmental problem occurred in the North Coastal area. Table (2) shows the mean grain yield performances (ardab/feddan) of the tested genotypes under the 15 yield trials. Highly significant differences in grain yield were detected between genotypes as well as all interactions.

It is evident from Table (2) that grain yield significantly decreased from 4.26 ardab/feddan (at Raffah) to 1.69 ardab/feddan at El-Mathani (severe drought stress). The new cultivar Giza 2000 exceeded the national check Giza 126 and the tested cultivars in all yield trials. In nine yield trials out of the 15, the yield of the new cultivar (Giza 2000) exceeded significantly the national check cultivar (Giza 126). Table (2) also presents the average yield in ardab/feddan for the tested lines and the check combined over years and locations. The combined analysis of tested genotypes over years and locations showed that Giza 2000 significantly exceeded Giza 126 in grain yield, with an average increase of 0.57 ardab/feddan, i.e. 19.4%. Under severe drought stress occurred at both El-Mathani and El-Goura, the new cultivar exceeded significantly the national check cultivar Giza 126 by about 0.38 and 0.41 ardab/feddan, i.e. 23.8 and 23.6%, respectively.

Yield performance of grain yield in newly reclaimed lands:

Table (3) shows the average grain yield in ardab/feddan for the tested genotypes in 24 yield trials representing different agro-climatic zones, in Egypt, during the period starting from 1998/1999 to 2001/2002. The experimental sites included El-Noubaria (calcareous soils), Sakha (diseases problems), el-Gemmeiza (optimum conditions), Mallawy (heat stress and aphid problems) and El-Hamoul, and El-Serw (soil salinity). The 24 yield trials performed included four barley cultivars (Giza 123, Giza 124, Giza 125 and Giza 126), three promising lines and the long term regional check cultivar (Rihane-03). Data of grain yield for various barley genotypes (check cultivars) and the tested new barley Giza 2000 in Table (3) shows highly significant differences among years, locations, genotypes and all types of interactions.

Table (2): **Average grain yield in ardab/feddan for the tested genotypes evaluated under rainfed conditions during 1999/2000 through 2001/2002.**

Season and Variety	Location					
1999/2000	**El-Mathani**	**El-Negela**	**El-Goura**	**Raffah**	**Sakha***	**Mean**
Rihane-03	1.48	2.15	1.79	4.75	3.42	2.72
Giza 123	1.82	2.31	1.78	3.37	3.69	2.59
Giza 124	2.19	2.07	1.72	4.55	2.36	2.58
Giza 125	2.14	2.66	2.02	4.25	2.82	2.76
Giza 126	1.82	2.75	1.88	4.08	3.83	2.87
Line 1	2.08	1.98	1.72	5.05	4.15	3.00
Line 2	1.85	1.66	2.00	3.89	3.27	2.54
Giza 2000	2.55	2.93	2.45	4.79	4.68	3.52
Mean	1.99	2.30	1.92	4.36	3.53	2.82
2000/2001	**El-Mathani**	**El-Negela**	**El-Goura**	**Raffah**	**Noubaria***	**Mean**
Rihane-03	1.65	2.70	1.75	3.21	4.44	2.75
Giza 123	1.76	2.36	1.68	4.06	5.62	3.10
Giza 124	1.57	2.47	1.87	4.16	5.07	3.03
Giza 125	1.54	2.76	1.42	3.93	5.01	2.93
Giza 126	1.55	2.38	1.76	4.08	4.24	2.80
Line 1	1.53	2.73	1.51	3.38	3.38	2.51
Line 2	1.46	2.69	1.64	4.25	5.57	3.12
Giza 2000	1.62	2.94	2.00	4.22	5.92	3.34
Mean	1.59	2.63	1.70	3.91	4.91	2.95
2001/2002	**El-Mathani**	**El-Negela**	**El-Goura**	**Raffah**	**Noubaria***	**Mean**
Rihane-03	1.42	2.61	1.61	3.04	5.69	2.87
Giza 123	1.25	2.27	1.95	4.51	5.74	3.14
Giza 124	1.61	2.29	1.43	4.81	5.42	3.11
Giza 125	1.30	2.02	1.87	4.82	4.61	2.92
Giza 126	1.44	2.20	1.56	4.58	5.96	3.15
Line 1	1.61	2.51	2.01	4.27	5.53	3.19
Line 2	1.43	2.39	1.66	4.28	5.15	2.98
Giza 2000	1.78	2.85	1.97	5.77	6.04	3.68
Mean	1.48	2.39	1.76	4.51	5.52	3.13
Average of genotypes over years						
Rihane-03	1.51	2.89	1.71	3.67	4.52	2.78
Giza 123	1.61	2.31	1.80	3.80	5.02	2.95
Giza 124	1.79	2.28	1.57	4.51	4.29	2.91
Giza 125	1.66	2.45	1.77	4.33	4.14	2.87
Giza 126	1.60	2.44	1.73	4.25	4.68	2.94
Line 1	1.74	2.41	1.75	4.23	4.35	2.90
Line 2	1.58	2.25	1.77	4.14	4.66	2.88
Giza 2000	1.98	2.91	2.14	4.99	5.55	3.51
Mean	1.69	2.44	1.79	4.26	4.65	2.96

L.S.D. at	5%	1%
For Years:	0.13	N.S
Locations:	0.29	0.32
Locations x Years:	0.34	0.39
Genotypes:	0.21	0.29
Years x Genotypes:	0.37	0.49
Locations x Genotypes:	0.54	0.67
Locations x Genotypes x Years:	0.83	1.09

* Supplied with sowing irrigation and left under rainfed conditions.

Table (3): Average grain yield in ardab/feddan for the tested genotypes evaluated under six different locations during the period from 1998 to 2002 under clay soil conditions (Irrigated).

Genotype	Location						Mean
	El-Gemmeiza	Sakha	Mallawy	El-Noubaria	El-Hamoul*	El-Serw*	
1998/1999							
Rihane-03	16.26	16.81	20.82	17.27	8.78	14.35	15.72
Giza 123	17.67	19.69	19.99	14.14	6.75	14.89	15.57
Giza 124	17.53	15.45	23.45	17.23	10.36	13.76	16.47
Giza 125	14.43	20.16	20.22	19.90	7.42	16.51	16.44
Giza 126	16.51	18.73	21.42	20.56	9.57	16.51	17.22
Line 1	17.65	18.31	22.14	18.18	7.83	15.32	16.57
Line 2	20.07	19.75	19.99	13.49	7.80	13.82	15.82
Giza 2000	20.31	22.50	23.99	20.87	10.34	16.28	19.05
Mean	17.59	19.05	21.50	17.71	8.61	15.18	15.61
1999/2000							
Rihane-03	17.57	16.34	20.94	13.88	9.93	12.20	15.14
Giza 123	20.44	20.22	21.05	18.23	7.42	11.42	16.47
Giza 124	24.77	17.77	19.39	14.40	8.86	10.05	15.87
Giza 125	23.07	17.83	21.54	17.50	8.73	11.25	16.65
Giza 126	22.92	19.81	20.54	15.13	9.93	11.49	16.65
Line 1	22.41	17.23	19.31	20.27	9.64	9.93	15.85
Line 2	23.34	16.51	17.83	18.44	7.78	9.16	15.51
Giza 2000	24.99	19.75	19.75	18.72	7.78	12.32	17.22
Mean	22.44	18.18	19.93	17.07	8.42	10.98	16.17
2000/2001							
Rihane-03	22.21	16.63	14.96	14.85	4.19	10.17	13.84
Giza 123	20.91	13.88	13.28	15.35	2.87	8.85	12.53
Giza 124	19.21	14.12	16.39	17.78	5.15	10.29	13.82
Giza 125	24.24	16.75	18.91	17.19	5.39	10.53	15.50
Giza 126	19.54	15.20	15.80	17.83	3.05	8.02	13.29
Line 1	18.58	15.58	15.92	15.99	4.07	9.57	13.32
Line 2	22.93	13.76	15.80	15.56	3.95	8.14	13.36
Giza 2000	23.59	18.79	17.59	19.03	5.51	10.77	15.88
Mean	21.45	15.50	16.08	16.70	4.27	9.54	13.94
2001/2002							
Rihane-03	16.63	14.77	16.83	13.52	6.80	7.67	12.70
Giza 123	17.60	15.95	16.12	11.42	5.05	8.73	12.48
Giza 124	17.95	14.34	17.57	11.30	7.23	7.78	12.70
Giza 125	18.32	16.24	18.00	12.32	6.39	7.35	13.10
Giza 126	17.58	15.94	17.17	10.65	6.69	8.31	12.72
Line 1	17.43	15.19	16.72	11.33	6.55	7.78	12.50
Line 2	19.68	14.84	15.90	13.40	5.79	8.09	12.95
Giza 2000	20.43	18.27	18.35	15.43	7.01	8.95	14.74
Mean	18.20	15.59	17.08	12.42	6.44	8.08	12.99
Average of genotypes over seasons							
Rihane-03	18.17	16.14	18.39	14.88	7.43	11.10	14.35
Giza 123	19.23	17.44	17.61	14.79	5.53	10.98	14.26
Giza 124	19.87	15.57	19.20	15.18	7.90	10.47	14.71
Giza 125	20.02	17.75	19.67	16.73	6.98	11.41	215.43
Giza 126	19.21	17.42	18.76	16.04	7.31	11.08	14.97
Line 1	19.04	16.60	18.27	16.44	6.35	10.65	14.56
Line 2	21.51	16.22	17.38	15.22	6.33	9.80	14.41
Giza 2000	22.23	19.83	19.92	18.51	7.55	12.08	16.72
Mean	19.92	17.13	18.65	15.97	6.94	10.95	14.92

L.S.D. at	5%	1%
For Years:	0.49	0.54
Locations:	0.59	1.56
Locations x Years:	1.19	1.57
Genotypes:	0.69	0.90
Years x Genotypes:	N.S	N.S
Locations x Genotypes:	1.58	N.S
Locations x Genotypes x Years	3.36	N.S

* Saline soils.

The average yield (ardab/feddan) ranged from 6.94 (at El-Hamoul, saline soils) to 19.92 (at El-Gemmeiza, optimum conditions). It is clear that grain yield is seriously affected by soil salinity.

The new cultivar Giza 2000 exceeded the national check cultivar Giza 123 in all yield trails except at Sakha and Mallawy in the second season (1999/2000). The yield of the new cultivar Giza 2000 ranged from 7.66 (at El-Hamoul) to 22.33 ardab/fedddan (at El-Gemmeiza) with an average of 16.72 ardab/feddan. The respective values for Giza 123 were 5.53, 19.23 and 14.26 ardab/feddan. Out of 24 yield trails. the yield of the new cultivar Giza 2000 significantly exceeded the national check cultivar Giza 123 only in eight yield trails. The combined analysis over years and locations showed that Giza 2000 significantly exceeded Giza 123 in grain yield, with an average increase of 2.46 ardab/feddan, i.e. 17.3%.

Table (3) also presents the average yield in ardab/feddan for the tested lines and the check combined over years and locations. The combined analysis of tested genotypes over years and locations shows that under severe drought stress occurred at both El-Mathani and El-Goura, the new cultivar significantly exceeded the national check Giza 126 by about 0.38 and 0.41 ardab/feddan, i.e. 23.8 and 23.6%, respectively. It could be noticed that Giza 2000 gave better yield than the other genotypes under saline soils. It exceeded the national check Giza 123 by about 2.13 and 1.10 ardab/feddan, i.e. 27.81 and 9.11%, in respective order.

Grain yield stability:

A Knowledge of genotype x environment interactions led to successful evaluation of stable genotypes which could be used in future breeding programs (El-Bawab 1999 and 2002). Stability parameters for grain yield of the tested genotypes were estimated by the method described by Eberhart and Russell (1966), who defined the stable genotypes as the one which had a regression coefficient of 1.0 and no deviation from regression mean square. An ideal genotype would have both a high average performance and stable across a wide range of environments.

Table (4) indicated superiority of the new cultivar Giza 2000 as compared with the national checks Giza 1234 and Giza 126 under rainfed conditions in newly reclaimed lands as well as combinations of yield trails.

Furthermore, the wider range of performance (2.71-26.74 ardab/ feddan) may promise better yield. Slops of regression on environmental indices did not differ from unity (b=1) for Giza 2000, at the mean time, S^2d value was significantly different from zero, which proved the stability of the new cultivar Giza 2000.

Table (4): Mean performances, Min., Max. and Avg of the studied genotypes grain yield under rainfed conditions and newly reclaimed lands as well as stability parameters over all locations and years.

Genotypes	Environment	Yield (ardab/feddan)			Stability parameter [1]			
		Min.	Max.	Avg.	b	S^2d	CD	X
Rihane-03	Rainfed [2]	1.22	6.09	2.78	0.92	1.18	0.95	9.90
	New Land [3]	3.94	23.77	14.35				
Giza 123	Rainfed	1.18	6.14	2.95	0.97	1.02	0.97	9.91
	New Land	2.71	22.53	14.25				
Giza 124	Rainfed	0.91	5.80	2.03	0.97	1.00	0.97	10.17
	New Land	4.83	25.73	14.17				
Giza 125	Rainfed	1.22	5.36	2.87	1.06	0.92	0.98	10.60
	New Land	5.05	25.94	15.43				
Giza 126	Rainfed	1.35	7.08	2.94	1.01	0.76	0.98	10.34
	New Land	2.88	24.52	14.97				
Line 1	Rainfed	1.34	6.44	2.90	0.98	0.65	0.98	10.07
	New Land	3.83	23.98	14.56				
Line 2	Rainfed	1.35	5.95	2.88	0.99	1.28	0.95	9.98
	New Land	3.71	24.46	14.41				
Giza 2000	Rainfed	1.52	6.46	3.51	1.09	0.38	0.99	11.64
	New Land	5.16	26.74	16.72				
Total Avg.		-	-	-	-	-	-	**10.33**

[1] Calculated from a serious of 39 yield trails conducted under rainfed areas and newly reclaimed lands during the period from 1998/1999 through 2001/2002.

[2] Calculated from a serious of 15 yield trails conducted under rainfed areas during the period from 1999/2000 through 2001/2002.

[3] Calculated from a serious of 24 yield trails conducted on newly reclaimed lands during the period from 1998/1999 through 2001/2002.

Diseases reaction:

The results presented in Table (5) show the reaction of the tested genotypes to the major barley diseases. i.e. powdery mildew, leaf rust and net blotch. It is clear from the table that the new cultivar Giza 2000 exhibited susceptible to leaf rust and resistant to powdery mildew and net blotch.

Based on performance tests and agronomic characteristics of the new line Giza 121*Giza 117/Bahteem 52//Giza 118/FAO 86, it could be recommended to be released as a new variety designated as Giza 2000. Giza 2000 could be recommended for both rainfed and newly reclaimed lands. The cultivar proved to be wide adaptable and can be used under a wide range of environments.

Table (5): Reaction* of the tested genotypes to the major barley diseases.

Genotype	Powdery mildew (seedling stage)	Powdery mildew (adult stage)	Leaf rust	Net blotch
Rihane-03	MS	MS	S	S
Giza 123	MR	MR	MS	S
Giza 124	MR	MR	MS	MS
Giza 125	R	R	MS	MS
Giza 126	R	R	S	R
Line 1	MR	MR	MS	MR
Line 2	MS	MS	MS	MR
Giza 2000	R	R	MS	R

*** R = Resistant**
MR = Moderate resistant
MS= Moderate susceptible

Molecular fingerprint of Giza 2000:

The entire fingerprint of this cultivar using the 38 primers was shown in Figure (1) and illustrate in Table (6). Reproductive PCR products were shaded in the table. The number of bands generated during PCR ranged from 1 (D09) to 5 (E19 and Z10). The size of PCR band ranged from 114 to 4547 bp. PCR products less than 100 and over 5000bp were excluded from the fingerprint because PCR reaction with these short primers should generate products within this range. The total number of generated bands across the 38 primer and the three replicates was 234, only 115 of them were reproducible. These bands with certain molecular weights for certain primers should be developed for each PCR reaction in order to detect fingerprint of a given genotype.

The unstable bands were suggested to result from the formation of artificial heteroduplexes between multiple amplified fragments (Wenger and Nielsen, 1991), or from non-specific amplification. He *et al.* (1992) described that these artifacts were minimized on the gradient gel, where the latter controls the consistency of PCR products by denaturing artificial heteroduplexes.

However, Yang and Quiros (1993) reported that RAPD technology provided a new alternative for cultivar identification in celery. The advantages of DNA-based pedigree assessment have been, recently. demonstrated in maize (Marasan *et al*., 1992) and barley (Bahieldin and Ahmed 1994).

Fingerprinting of newly developed cultivars is important in which it can be used as an appraisal when commercializing these cultivars to preserve the breeder's rights. Comparison with the available germplasm to develop cultivar-specific RAPD (random amplified polymorphic DNA) markers is another important approach to trap the material mix mistakenly happened during seed storage. Besides, molecular markers for agronomically important characteristics can be detected. Cultivar identification in Egyptian barley was recently done by Bahieldin and Ahmed (1994) utilizing six cultivars. As a recommendation, all Egyptian barley germplasm ought to be characterized on the structural as well as functional level in order to detect and/or isolate value gene (s) for subsequent improvement of Egyptian barley for yield components, and virus fungus and insect resistance following conventional breeding as well as genetic engineering

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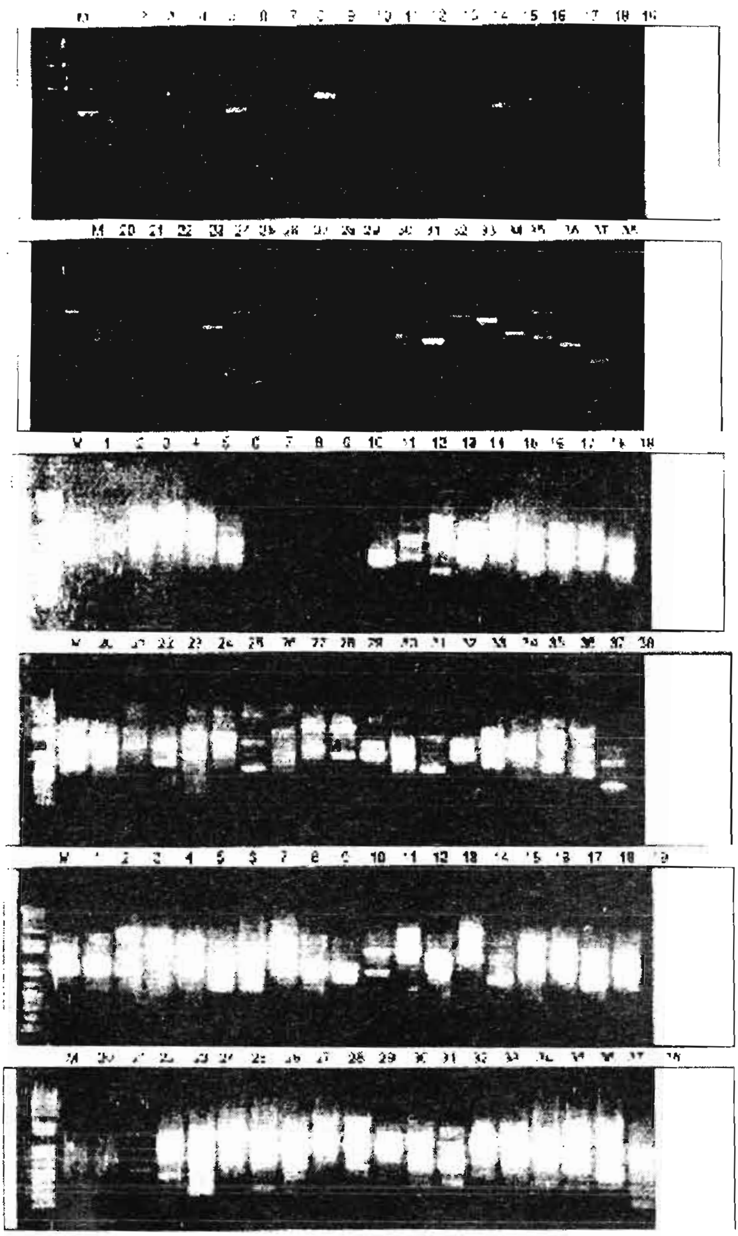

Figure 1. Photographs of PCR fingerprint of the new barley cultivar Giza 2000 with 38 different random 10 mer primers in three replicates (R1, R2 and R3). Numbers represent primer codes shown in Table (6). M refers to 1 kb plus DNA ladder.

Table (6): PCR fingerprint of the new barley cultivar Giza 2000 with 38 different random 10 mer primers in three replicates (R1, R2 and R3).

Lane No	Primer Name	Band No.	R1 (bp)	R2 (bp)	R3 (bp)	Lane No.	Primer name	Band No.	R1 (bp)	R2 (bp)	R3 (bp)
1	A04	1	2429	2715		11	B13				1743
		2	1769	1715	1565						1336
		3	921	986	932			1	976	921	
		4	565		513			2		721	784
2	B01				2315	12	B14	1		2413	2402
		1		1270	1140			2		1461	1408
		2	983	1012	932					1193	
		3	781	623	570			3	761	803	
		4	447		346				677		
3	B02	1	3206	3241							513
					2781	13	B15			2685	
		2	2362	2357						1872	
		3	1536	1514	1408					1424	
		4		959	890			1	1065		1082
			683					2	899		869
			490					3	589	509	447
4	B05			3129		14	B16	1		2300	2402
					2681			2		1723	1695
		1	2173	1982				3		1121	1111
					1743			4	870	836	
		2	1563	1553	1408						540
			1307			15	B18			2300	
					977			1		1723	1791
		3	755		667			2		1121	1111
			545					3	774	836	633
			349			16	C01	1		1766	1565
5	B06			3020				2		1241	1171
				2357				3	885	1021	932
		1	1864	1935	1791						723
				1335						588	
		2	1055	1092	1000						388
					827						327
6	B07			1955		17	C05			1900	
					1650					1521	
			1455					1	1230		1234
				1255				2		859	1000
		1		1051	954			3	774	672	
		2	863	782	743	18	C08	1	1276	1195	1202
		3	660	582	555					946	
7	Bo8				3341				761		
			2056					2		594	585
					1695				301		
		1	1379		1202	19	C10				1140
		2	878		600			1		1052	1026
8	B10		4116					2	688		743
					3220					534	
		1	1708		1743				394		
					1335				287		
		2	983		1140	20	C19			2342	
			878					1	1557	1419	
9	B11	1	1955	1935	2074			2	1101	1264	
		2	1738	1477	1650			3	940	897	
			1093					4	787	704	
					869	21	D07			2000	
		3	606		540			1	1350	1162	
10	B12	1		1918	1791			2	990	873	
			1036					3	754	704	
		2	821	921	784						
			508								

Table (6): Cont.

Lane No.	Primer Name	Band No.	R1 (bp)	R2 (bp)	R3 (bp)
22	D09			1825	
				1407	
				1179	
		1	526	460	
23	D10	1	1350		1301
		2	970	1094	977
		3	735	676	827
		4	424	344	469
			125		
24	D20			4381	
				3738	
					1945
					1524
				1337	
		1	1010		954
				817	
		2	681		685
		3	468	537	454
		4		344	310
				222	
25	E07			4381	
				3621	
			1902		
					1650
		1	1487	1407	1336
				1150	
		2	750		827
		3	655		685
			228		
26	E09			4547	
				3212	
		1	1487		1408
				1221	
					1000
		2	681		763
				545	
		3	335		247
27	E19			4269	
				3645	
				1650	
		1	1050		1000
		2	358	850	
		3	642	685	667
		4	403	500	454
		5		266	274
28	O02			4136	
				3532	
					2632
				1945	
			1672		
			1403		
		1	1202		1171
		2		947	932
			542		
				500	
29	O05		2953		
					2191
				1841	
		1	1082		1026
				805	
		2	531	484	613
30	O09			2575	
					1301
		1	1169	1105	1000
		2	833	827	911
				743	
31	O10		1732		
			1366		
		1		1000	1140
		2	786		585
				545	
		3	376	239	322
32	O12				1565
				1350	
			1169		
			700		
		1	417	469	578
		2		250	334
33	O18		1339		
		1		1078	1171
		2	771	723	850
			506		
					454
				162	
34	O20		2376		
				1492	
		1	1215	1025	1082
					932
		2		667	743
		3		561	650
		4	347	286	
35	Z08				2756
				2342	
			1420		
		1		1252	1267
		2	1040		911
		3	867	827	827
		4	461		530
					310
36	Z10	1	2442	2269	2191
		2	1534	1455	1408
		3		1000	1171
		4	961		977
			786		
		5	449	500	500
					239
37	Z11	1		1650	1524
			1159		
		2	809	805	763
			640		
		3	489	530	469
		4		400	359
38	Z13	1	951	921	
					805
		2		613	545
		3	390		372
				200	
		4		114	145

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جيزة ٢٠٠٠ صنف جديد من الشعير يلائم المناطق الجديدة والزراعات المطرية

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يهدف هذا البحث الى التعريف بصنف الشعير الجديد (جيزة ٢٠٠٠) الذى يتميز بالإنتاجية العالية من المحصول ويجود فى الأراضى الجديدة والأراضى المطرية. أنتج هذا الصنف من التهجين بين الصنف المحلى جيزة ١٢١ والسلالة المبشرة ١/١٣/٣٦٦ . قيم هذا الصنف بالمقارنة مع الأصناف المحلية جيزة ١٢٣، جيزة ١٢٤، جيزة ١٢٥، جيزة ١٢٦ وسلالتين مبشرتين من البرنامج المحلى بالإضافة الى الصنف واسع الإنتشار ريحان ٣ . أقيمت ٣٩ تجربة محصولية (١٥ تجربة محصولية فى الأراضى المطرية على مدار ثلاث سنوات ١٩٩٩/٢٠٠٠ وحتى ٢٠٠١/٢٠٠٢ و٢٤ تجربة محصولية فى الأراضى الجديدة على مدار أربع سنوات ١٩٩٨/١٩٩٩ وحتى ٢٠٠١/٢٠٠٢). أظهرت النتائج تفوق الصنف الجديد جيزة ٢٠٠٠ معنوياً على صنف المقارنة جيزة ١٢٦ تحت ظروف الأراضى المطرية وأعطى محصولاً مقداره ٣,٥١ أردب/فدان بزيادة مقدارها ٠,٥٧ أردب/فدان (١٩,٤% عن صنف المقارنة). وفى الأراضى الجديدة تفوق الصنف الجديد جيزة ٢٠٠٠ على صنف المقارنة جيزة ١٢٣ بمقدار ٢٠٤٦ أردب/فدان أى بنسبة ١٧,٢٥% . ويتميز الصنف الجديد

بالعديد من الصفات المرغوبة من قدرة إنتاجية عالية و مقاومته لأمراض الشعير الشائعة. تم تعـريف البصمة الوراثية لصنف الشعير جيزة ٢٠٠٠ باستخدام جهاز PCR وذلك باستخدام ٣٨ بـادئ عشوائى وتم الحصول على ١١٥ حزمة يمكن عن طريقها تعريف صنف الشعير الجديد جيزة ٢٠٠٠ وذلك حفاظاً على ملكية الصنف وحق المربى لقسم بحوث الشعير بمعهد بحوث المحاصيل الحقلية.