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*Giza 135 A NEW WIDE ADAPTED HULL-LESS BARLEY VARIETY FOR ALL BARLEY PRODUCTION AREAS IN EGYPT

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ABSTRACT

The paper decides the development and the description of Giza 135 the six rowed spring type hull-less barley (Hordeum vulgare L.) variety selected by the Egyptian / European Project on Sustainable Barley Production Under Rainfed in Egypt, Field Crops Res. Institute, ARC. It has been identified for irrigated and rainfied areas as drought tolerant, high yielding, and early maturing variety. This new variety showed moderate resistance to leaf rust (Puccinia hordei), and resistance to net blotch (Drechslera teres) and strip disease (D. graminea). Giza 135 was selected from the cross "ZARZA/BERMEJO/4/DS4931//GLORIA-BAR/COPAL/3/SEN/5/AYAROSA" using the modified bulk method. The cross was received from ICARDA/CIMMYT Barley Program, CIMMYT 1998/99 season.Giza 135 has been evaluated for eight years at irrigated areas and five years at rainfied areas in three levels of field experiments including: Preliminary and Advanced multi-location yield trials as well as farmer's fields (On-Farm) trials from 2002/2003 to 2009/2010. Giza 129 and Giza 130 the recommended hull-less barley varieties were used as check varieties in this study.

Results of 18 trials in irrigated areas showed that the new hull-less barley variety Giza 135 outyielded the check variety (Giza 129) significantly by about 38.6%. While data in rainfied areas (7 trials) indicated that Giza 135 outyielded the check varieties Giza 129 and Giza 130 significantly by about 13.1 and 26.6% respectively. Grain yield of the new variety G.135 showed stability under both irrigated or rainfed areas. The whole grain meal of G.135 has higher protein, lipids and ash contents more than G.129, G.130 and G.131 the hull-less barley varieties and has more protein and ash contents than G.126 the hulled barley variety. In addition, G.135 is suitable to be growing well in the desert as drought tolerant feed crop.

DNA fingerprinting was used to reveal the unique banding pattern of the new variety using RAPD marker.

Key words: Hull-less Barley, Irrigated areas, Rainfied areas . Stability, , Food Barley.

INTRODUCTION

In Egypt barley (*Hordeum vulgare* L.) is mainly used for animal feeding. Recently, new interest in using the crop for human consumption as healthy food, has increased. Therefore, hull-less barley has been considered as an ideal type to achieve this goal. Barley is the main cereal crop grown along the Northern Coast of Egypt and in the new reclaimed lands. Barley

area in the Nile Valley of Egypt has been gradually declined, especially at locations where soil and irrigation are feasible and can be grown with other strategic crops such as wheat. On the other hand, barley production area increased in the new reclaimed lands under different irrigation systems. The total harvested area was 57,000 ha in the eighties. While it increased about 135,000 ha now. In the mean time, irrigated barley yields have tended to increase gradually over the past three decades from 2.92 t ha^{-1} in the eighties to 3.63 t ha^{-1} in 2008/09. Under rainfed conditions, barley productivity increased from 0.44 t ha^{-1} during the period 1986-1991 to 1.9 t ha^{-1} (FAO report 2008/09).

This improvement in productivity might be attributed to releasing drought tolerant, disease resistant and stable cultivars for rainfed areas such as Giza 125, G.126, G.129, G.130, G.131 and G.2000 are examples. Also barley cultivars developed for such areas should be stable under the harsh conditions of the marginal lands. El-Sayed (2005), El-Sayed *et al* (2002a, 2002b, 2007a, 2007b and 2011), Noaman *et al* (1995) and El-Bawab (1999 and 2002) reported that, it is possible to identify barley genotypes that have high yielding potentiality under severe drought stress and high average stability.

Hull-less barley is healthy human food, with this respect, El-Sayed (2005) reported that Giza 129, Giza 130 and Giza 131 hull-less barley cultivars exceeded Giza 123 hulled cultivar and Sakha 69 wheat cultivar in the soluble dietary fibers and total ß glucan contents. Also he reported that, these three hull-less cultivars exceeded Sakha 69 wheat cultivar in protein content.

This study aimed to develop high yielding, drought tolerant, early maturing, stable and diseases resistant naked barley variety with high grain quality characters. This might sustain barley production in the marginal lands of Egypt and allow the use of barley dual purpose crop for food and feed.

MATERIALS AND METHODS

The new hull-less spring barley variety Giza 135 was developed by the Egyptian/European Project on Sustainable Barley Production Under Rainfed Conditions, Field Crops Res. Institute, ARC, Giza, Egypt. Giza 135 was selected from the cross "ZARZA/BERMEJO/4/DS4931//GLORIA-BAR/COPAL/3/SEN/5/ANYAROSA" using the bulk method. This cross was received from ICARDA/CIMMYT Barley Program. The new hull-less barley variety Giza 135 was evaluated in one or more than one trials planted in six irrigated locations namely; EL-Gemmeiza, Sakha, Nubaria, New Valley, Ras Sider and El-Sharkia during eight successive seasons (2002/2003, 2003/2004, 2004/2005, 2005/2006, 2006/2007, 2007/2008, 2008/2009 and 2009/2010). Two check varieties; Giza 129 and Giza 130 were included in each trial. Moreover, the new hull-less barley variety (Giza 135) was evaluated at seven different sites under rainfed conditions in North Sinai and North West Coast during five successive seasons (2002/2003, 2003/2004, 2004/2005, 2005/2006 and 2007/2008). The evaluation included grain yield (GY), straw yield (SY), plant height (PLHT), spike length (SPL) and harvest index (HI) under different environments in each of the irrigated and rainfed trials. The trials were designated as Preliminary Naked Barley Yield Trial (PNBYT) and Advanced Naked Barley Yield Trial (ANBYT). Giza 135 was then included in large scale experiments in the farmers fields (On-Farm Experiments) where, compared with farmer's varieties (Giza 129 and 130). The yield trials were laid put in a randomized complete blocks design (RCBD) with three replications. The area of experimental unit differed from trial to another i.e.; 4.2m^2 for PNBYT, 5.6 m^2 for ANBYT and 10 m^2 for the On-Farm Experiments. Seeding rate was 100 to 110 kg/ha in irrigated trials and 72 kg/ha

at rainfied trials. Data was subjected to statistical analysis according to the methods of variance analysis using least significant differences (LSD) for the comparison among mean (Snedecor and Cochran, 1989). Barteletts test of homogeneity was adopted indicating no statistical evidence for heterogeneity for each of irrigated or rainfed trials, separately. In statistics, Bartlett's (Snedecor and cochran, 1983) is used to test if K samples are from populations with equal variances. Equal variances across samples is called homogeneity of variances. Some statistical tests, for example the analysis of variance, assume that variances are equal across group or samples (Bartlett 1937).

Thus combined analysis over all environments in each of the irrigated and rainfed areas were performed to estimate the significant differences among genotypes (Steel and Torrie 1980). Stability parameters were estimated according to (Eberhart and Russel 1966). The stability parameters were estimated for GY of the tested genotypes in each of irrigated trials (18 environments) and rainfed trials (seven environments). If (b) is not significantly different from one, the cultivar is considered adapted for all environments. The hypothesis that any regression coefficient does not differ from unity was tested by the T test (Steel and Torrie,1980) using its own standard error for regression. A significant F value would indicate that the S^2d was significantly different from zero.

As for diseases, Giza 135 was evaluated for resistance to the major barley diseases. i. e. leaf rust (LR), Powdery mildew (PM), net blotch (NB) and stripe disease (SD). PM and NB reactions were recorded using the double digit scale 00 to 99. The first digit gives the relatively response to disease (Sarri and Prescott 1975), where scores zero, one, two, three, and four are considered resistant while five, six, seven, eight and nine were susceptible. The second digit shows the disease severity as a percentage of the leaf area affected in terms of zero to nine (Eyal *et al* 1987). LR reaction was recorded as severity and response (percentage of leaf area affected) according to the modified Cobb Scale (Peterson *et al* 1948). SD reaction was recorded as percentage of infected plants.

Samples from different barley flour of Giza 135 and the check varieties Giza 129, Giza 130, Giza 131 (hull-less varieties) and Giza126(hulled variety) grown at Giza station were chemically analyzed for protein, crude Fat, ash and crude fibers according to the methods described in the A. O. A. C (2005). Moisture was determined according to the method described in the A. O. A. C. (1995). Amino acid lysine content was determined according to the method described in the A. O. A. C (2005) using amino acid analyzer (Biochrom 30). **E Z Chrome Soft Ware** was used for data collection and processing.

DNAs were isolated from 10-day-old seedlings for each line using a CTAB (cetyl thimethyl ammonium bromide) method (Webb and Knapp, 1990). A total of eight 10-mer oligonucleotides with arbitrary sequence from Operon (kits A, B, D and E) were used in RAPD analysis (Table 8). The PCR reaction mixture consisted of 20-50ng genomic DNA, 1×PCR buffer, 2.0 mmol/L MgCl2, 100 µmol/L of each dNTP, 20 pmol/L primer and 1U Taq polymerase in a 25µL volume. The amplification protocol was 94 °C for 4 min to pre-denature, followed by 45 cycles of 94 °C for 1 min, 36 °C. Amplification products were fractionated on 1.5 % agarose gel.

Data analysis... RAPD data were scored for presence (1), absence (0).

RESULTS AND DISCUSSION

Varietals variations

Simple and combined statistical analyses for each of the three trials. i.e. PNBYT, ANBYT and On-Farm demonstration experiments were conducted for all the studied characters in each of irrigated lands or rainfed areas. Results showed significant differences among genotypes (G) and environments (E) (Tables 1 and 2). Means of GY, SY, HI, PLHT and SPL. of the hull-less barley variety Giza 135 and the two recommended check varieties (Giza 129 and Giza 130) obtained from 18 irrigated trials and the seven rainfied trials are shown in Tables3 and 4.

Data in Tables 1 and 2 showed significant differences among the environments and genotypes for PLHT, SPL, GY, SY and HI traits in both irrigated and rainfed areas.

Data in (Table 3) showed that Giza 135 the new hull-less barley variety outyielded the check variety (Giza 129) significantly by about 38.6% in irrigated areas, while data in (Tables 4) indicated that the Giza 135 new hull-less barley outyielded the check varieties Giza 129 and Giza 130 significantly by about 13.1 and 26.6% respectively in rainfied areas.

Table (1): Mean squares of Environments, Genotypes, Environments x Genotypes and Error for plant height, spike length grain and straw yields and harvest index in irrigated trials.

S.O.V	d.f	Mean Squares				
		plant height	spike length	Grain Yield	straw yield	harvest index
Environments	17	2563.2**	9.33*	5893.5**	690.92**	156.39**
Rep./Environments	4	970.2	2.3	818.3	232.6	19.5
Genotypes	2	1763.25**	13.3**	3988.96*	523.89**	195.3**
Envir. X Geno.	34	22.39	2.5	1.20	80.65	16.32
Error (pooled)	102	9.63	0.66	1.63	2.36	30.60

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

Table (2): Mean squares of Environments, Genotypes Environments x Genotypes and Error for plant height, spike length grain and straw yields and harvest index in rainfied trials.

S.O.V	d.f	Mean Squares				
		plant height	spike length	Grain Yield	straw yield	harvest index
Environments	6	478.9**	65.3**	36.1**	633.5**	98.0**
Rep./Environments	3	158.6	4.2	9.65	80.4	15.3
Genotypes	2	554.3**	55.3**	28.6**	440.44**	85.63**
Envir. X Geno.	12	40.6	5.6	5.95	9.7	7.96
Error (pooled)	36	17.36	1.35	2.39	0.98	6.6

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

Table (3): Mean values of Grain yield (GY), Straw Yield (SY), Harvest Index (H.I), Plant Height (PLHT) and Spike Length (SPL) at G.135,the new Hull-less barley variety compared with the national check Giza 129 and Giza 130 hull-less barley varieties in18 environments at irrigated areas.

Environments				GY (Kg/ha)			SY (Kg/ha)			HI%		
No.	Season	Site	Trial**	G.135	G.129	G130	G.135	G.129	G130	G.135	G.129	G130
1	2002/2003	El-Gemmeiza	PNBYT	6916.0a*	5309.5b	5726.1b	13954.0a	13738.1a	14353.2a	33.1a	27.8a	28.5a
2	2002/2003	Nubaria	PNBYT	5428.5a	4345.2a	3345.2a	14464.3b	10416.7c	15702.4a	28.8a	29.4a	17.4a
3	2003/2004	El-Gemmeiza	PNBYT-SEG	4450.6a	.....	3447.0b	12923.3a	.....	9563.6b	25.4a	.....	26.5a
4	2003/2004	Sakha	PNBYT-SEG	3748.5a	.....	2975.0b	8151.5a	.....	6307.0a	27.7a	.....	33.3a
5	2004/2005	El-Gemmeiza	PNBYT-INT	6172.1a	.....	5236.0b	15803.1a	.....	14041.9a	28.06a	.....	27.22a
6	2005/2006	NEW-Valley	ANBYT	7142.9a	5317.4ab	3571.4b	13492.1a	9444.4b	10634.9b	21.4a	25.2a	20.1a
7	2005/2006	Sakha	ANBYT	4444.4a	1488.1ab	2341.4b	15873.0a	7242.1b	10754.0b	21.9b	25.7a	20.4c
8	2006/2007	Sakha	ANBYT	5000.0a	3944.4c	4444.4b	10952.3a	10103.2a	9761.9a	31.3a	28.0a	31.2a
9	2006/2007	NEW-Valley	ANBYT	4821.4a	2797.6b	2797.0b	5416.6a	4464.3b	3630.9c	47.0a	38.5c	43.5b
10	2007/2008	Ras Sider	ANBYT	1666.7a	1466.7ab	1200.0c	4733.3a	4266.7a	3633.3a	26.0a	25.5a	25.5a
11	2007/2008	Nubaria	ANBYT	3200.0a	3066.7a	3100.0a	7400a	5900b	5266.7b	29.9b	34.2a	37.7a
12	2007/2008	NEW-Valley	ANBYT	6125.0a	3583.3c	4041.7b	11125.0a	8166.7b	6708.3c	35.5a	30.5a	37.6a
13	2007/2008	El-Gemmeiza	ON-Farm Veri	4443.6a	.....	4282.3a	14356.5a	.....	11651.5b	23.6a	.....	26.8a
14	2007/2008	Nubaria	ON-Farm Veri	4208.3a	.....	3750.0a	7625.a	.....	737.5	35.4a	.....	33.9a
15	2008/2009	El-Gemmeiza	ON-Farm Demo	3333.3a	3125.0ab	2916.6b	12666.6a	12458.3a	12041.6a	20.76a	20.29a	19.64a
16	2008/2009	New Vally	ON-Farm Demo Farmer	4916.6a	4895.8a	3791.6b	6312.5a	8333.3a	6083.3a	43.8a	37.1a	38.4a
17	2009/2010	Nubaria	ON-Farm Veri	320.2a	290.9b	320.1a	3721.4a	3484.1a	3913.2a	7.92a	7.70a	7.56a
18	2009/2010	El-Sharkia	ON-Farm Veri	321a	290b	302a	3545.6a	3210.0c	3381.3b	8.3a	8.1a	8.1a
Combined				4259.0a	3070.8b	4370.0a	10139.8a	7944.0c	8231.5b	27.5a	26.0a	26.9a
*** δ^2					0.063			0.036			0.121	

*** Means followed by similar letters in each row are not significant different at 0.05 level.**

****PNBYT: Preliminary Naked Barley Yield Trial.**

****PNBYT Seg. : Preliminary Naked Barley Yield Trial (Source of seed is segregated populations).**

**** PNBYT Int. : Preliminary Naked Barley Yield Trial (Source of seed is Introduction populations).**

**** ANBYT: Advanced Naked Barley Yield Trial.**

****ON-Farm Veri.: ON Farm Verification Trial.**

****ON-Farm Demo. : ON Farm Demonstration Trial.**

**** ON-Farm Demo. Farmer : ON Farm Demonstration Conducted by farmers.**

***** δ^2 Chi-Squared test.**

Table (3): Cont.

Environments				PLHT (cm)			SPL (cm)		
No.	Season	Site	Trial**	G.135	G.129	G130	G.135	G.129	G130
1	2002/2003	El-Gemmeiza	PNBYT	103.7b	105.7a	97.0c	9.5a	8.8b	7.7c
2	2002/2003	Nubaria	PNBYT	110.2a	105.3b	94.6ab	7.3b	8.0a	6.3c
3	2003/2004	El-Gemmeiza	PNBYT-SEG	109.3a*	--------	104.3b	8.9b	-------	9.0a
4	2003/2004	Sakha	PNBYT-SEG	100.1a	--------	93.2a	9.0a	-------	8.8b
5	2004/2005	El-Gemmeiza	PNBYT-INT	105.3a	-------	101.1a	8.5a	-------	9.3a
6	2005/2006	NEW-Valley	ANBYT	96.8a	90.5ab	88.3b	7.7a	6.3ab	7.2b
7	2005/2006	Sakha	ANBYT	105.3a	96.8c	100.2b	8.6ab	8.9a	7.1b
8	2006/2007	Sakha	ANBYT	102.3b	111.3a	100.2b	9.9a*	8.5c	9.2b
9	2006/2007	NEW-Valley	ANBYT	110.1a	105.3b	103.9c	6.8c	7.6b	8.5a
10	2007/2008	Ras Sider	ANBYT	102.1a	109.6a	100.8a	6.6b	5.6c	7.3a
11	2007/2008	Nubaria	ANBYT	99.3b	100.3a	89.9c	7.9a	8.5a	6.9b
12	2007/2008	NEW-Valley	ANBYT	110.6a*	100.9b	99.3c	7.2ab	6.3c	8.2a
13	2007/2008	El-Gemmeiza	ON-Farm Veri	104.3a	-------	100.6a	9.3a	-------	7.5b
14	2007/2008	Nubaria	ON-Farm Veri	105.3a	--------	101.3a	6.9a	-------	6.0a
15	2008/2009	El-Gemmeiza	ON-Farm Demo	103.6a	100.1b	95.7c	8.9a	7.1b	7.8b
16	2008/2009	New Vally	ON-Farm Demo Farmer	105.3a*	100.7b	98.6c	6.5b	5.9c	8.0a
17	2009/2010	Nubaria	ON-Farm Veri	96.4c	100.3a	99.4b	7.2a	6.2a	6.1a
18	2009/2010	El-Sharkia	ON-Farm Veri	110.3a*	108.4b	105.3c	9.6a	7.3b	7.9b
Combined				**104.4a**	**102.7a**	**98.5b**	**8.1a**	**7.3b**	**7.7a**
*** δ^2					**0.123**			**0.166**	

*** Means followed by similar letters in each row are not significant different at 0.05 level.**
****PNBYT: Preliminary Naked Barley Yield Trial.**
****PNBYT Seg. : Preliminary Naked Barley Yield Trial (Source of seed is segregated populations).**
**** PNBYT Int. : Preliminary Naked Barley Yield Trial (Source of seed is Introduction populations).**
**** ANBYT: Advanced Naked Barley Yield Trial.**
****ON-Farm Veri.: ON Farm Verification Trial.**
****ON-Farm Demo. : ON Farm Demonstration Trial.**
**** ON-Farm Demo. Farmer : ON Farm Demonstration Conducted by farmers.**
***** δ^2 Chi-Squared test.**

Yield and other related traits performance

I-Irrigated areas:

Means of eighteen yield trials, which included Giza 135 and the check varieties Giza 129 and Giza 130 (hull-less barley) were carried out during eight seasons (Table 3). Grain yield and spike length of G.135 did not differ significantly with the check variety (G.130). Meanwhile, G.135 showed significant difference than the check variety G.129. For plant height G.135 had no significant difference than the check variety (G.129). The new variety (G.135) showed significant difference than the check variety G. 130. Table 3 shows that straw yield of Giza 135 was significantly different about the national checks Giza 129 and Giza 130. For harvest index the new variety (Giza 135) showed non- significant difference than the two checks Giza 129 and Giza 130. The present findings are in a harmony with those obtained by El-Sayed (2005), El-Sayed *et al.* (2002a, 2002b, 2007 and 2011), Noaman *et al.* (1995) and El-Bawab (1999 and 2002). Test of homogeneity gave non significantly for all traits.

II-Rainfied areas:

Seven yield trials, which included Giza 135 and the check varieties Giza 129 and Giza 130 (hull-less barley) were carried out during five seasons (Table 4). Means of GY, SY, PlHt, SPL and HI of Giza 135, the new hull-less barley variety compared with the two checks Giza 129 and Giza 130 in seven different environments are reported in (Table 4).

Data in (Table 4) indicated that, grain yield and straw yield of G.135 were significantly differ than the two checks Giza 129 and Giza130. For harvest index, plant height and spike length of G.135 had non significant difference about the two checks (G.129) and Giza 130. These result refere to the possibility to select drought tolerant barley cultivars under drought stress in rainfed area of Egypt and confirmed those obtained by El-Sayed (2005), El-Sayed *et. al.* (2002a, 2002b, 2007 and 2011), Noaman *et al.* (1995) and El-Bawab (1999 and 2002). Test of homogeneity gave non significantly for all traits.

Yield Stability:

Stability parameters adopted after Eberhart and Russel, 1966, were used in this study to obtain information about variety x environment interaction and the ability to cope with the dilemma of fluctuating environments in target areas. Table (5) show means of grain yield and the stability parameters i.e. slope of regression line (b) and mean square of the deviation from regression (S^2d) for the new variety G.135 and the two checks (G.129 and G.130). It was concluded from that, the three barley cultivars were more stable because they had b=1 and S^2d=0. As it was explained by Eberhart and Russel (1966), a desirable variety should have a high mean yield (above average) with b value not significantly different from one and S^2d not significantly different from zero in irrigated areas. On the other hand, Giza 135 and Giza 130 were recorded more stable because they had b=1 and S^2d=0. However, G.135 variety had higher mean grain yield than G.130 which emphasizes the possibility of growing that variety in rainfed areas.

Disease reaction:

Resistance of the new barley variety G.135 was studied under the natural infection in the target areas. The results in Table (6) indicated that the new variety G.135 have a good level of resistance to the major diseases under irrigated lands compared with the commercial barley varieties G.129 and Giza 130. Concerning rainfed areas, barley diseases reactions on this variety was very low compared with the irrigated areas.

Table (4): Mean values of Grain yield (GY), Straw Yield (SY), Harvest Index (H.I), Plant Height (PLHT) and Spike Length (SPL) of the one Hull-less barley variety compared with the national checks Giza 129 and Giza 130 (hull-less barley) in 7 environments at rainfied areas.

Environments				GY (Kg/ha)			SY (Kg/ha)			HI%		
No	Season	Site	Trial**	G.135	G.129	G130	G.135	G.129	G130	G.135	G.129	G130
1	2002/2003	North Sinai (Rafh)	PNBYT	2098.2a*	1508.9b	1279.7c	8377.9a	6348.2b	6577.7b	20.0a	19.2a	16.2a
2	2002/2003	NWC (El-Habla)	PNBYT	848.2a	535.7c	705.3b	3199.4a	2678.5a	3163.7a	20.9a	16.6a	18.2a
3	2003/2004	North Sinai (Rafh)	PNBYT	944.4a	755.5a	888.8a	2865.1a	2736.5a	3238.1a	24.7a	21.6a	21.5a
4	2004/2005	North Sinai (Rafh-El-Mattala	PNBYT-SEG.	430.6a	--------	330.6b	4801.0a	-------	4141.6a	8.2a	------	7.3a
5	2005/2006	North Sinai (Rafh-El-Balad)	ANBYT	890.0a	786.1a	667.5a	4212.6a	2833.1a	4212.6a	16.8a	27.7a	17.7a
6	2005/2006	North Sinai (Rafh-El-Mattala	ANBYT	296.6a	267.0a	178.0a	1453.7a	1050.2b	563.6b	16.9c	20.2b	25.8a
7	2007/2008	North Sinai (Rafh)	ON-Farm Demo Farmer	1650.0a	1566.6a	1600.0a	3266.6a	3566.6a	3400.0a	32.4a	35.9a	32.0a
Combined				**1022.5a**	**903.3b**	**807.1c**	**4025.1a**	**3202.1c**	**3613.9b**	**19.9a**	**23.5a**	**19.8a**
*** δ^2					**0.034**			**0.112**			**0.192**	

. Table (4): Cont.

Environments				PLHT (cm)			SPL (cm)		
No	Season	Site	Trial**	G.135	G.129	G130	G.135	G.129	G130
1	2002/2003	North Sinai (Rafh)	PNBYT	45b	55a	40c	5b	6a	5.3b
2	2002/2003	NWC (El-Habla)	PNBYT	40b	56a	35c	4.5c	5b	6.2a
3	2003/2004	North Sinai (Rafh)	PNBYT	55ab	52b	56a	6a	5.3b	5.9ab
4	2004/2005	North Sinai (Rafh-El-Mattala	PNBYT-SEG.	60a	-----	55b	5a	-----	4.9a
5	2005/2006	North Sinai (Rafh-El-Balad)	ANBYT	56b	58a	52c	4a	4.8a	4.3a
6	2005/2006	North Sinai (Rafh-El-Mattala	ANBYT	63a	48c	50b	6ab	5.6b	6.1a
7	2006/2007	North Sinai (Rafh)	ON-Farm Demo Farmer	70ab	75a	71ab	7a	6.7ab	6.8ab
Combined				55.5a	57.3a	51.2a	5.3a	5.6a	5.5a
*** δ^2					0.254			0.523	

* Means followed by similar letters in each row are not significant different at 0.05 level.
**PNBYT: Preliminary Naked Barley Yield Trial.
** ANBYT: Advanced Naked Barley Yield Trial.
** ON-Farm Demo. Farmer : ON Farm Demonstration Conducted by farmers.
*** δ^2 Chi-Squared test.

Table (5): Means of cultivars and stability parameters for grain yield of Giza 135, Giza 129 and Giza 130 under 18 various environments at irrigated areas and 7 various environments at rainfied areas.

Varieties	Irrigated trial			Rainfied trial		
	GY			GY		
	Mean (kg/ha)	b	S^2d	Mean (Kg/ha)	b	S^2d
G.135	4259.0	0.951	0.022	1022.5	0.83	0.006
G.129	3070.8	0.944	0.035	903.3	1.63**	10.06**
G.130	4370.0	0.861	0.052	807.1	0.93	0.015

** indicate significant at 0.01 levels of probability.

Table (6): Assessment of the major barley diseases of the newly hull-less barley variety Giza 135 compared with Giza 129 and Giza 130 under the nature infection of the field at Sakha.

Cultivar	Leaf Rust (LR)	Powdery Mildew (PM)	Net Blotch (NB)	Stripe disease
Giza 135	15 MR**	3/2	0	0
Giza 129	10MR**	4/1	0	0
Giza 130	Trace R*	2/1	0	0

R*= Resistant MR**= Moderately Resistant

Chemical composition and nutritional value:

The Chemical composition of whole grains meal flour new hull-less barley variety (G.135), three released hull-less barley cultivars (G.129, G.130 and G.131) and the hulled barley cultivar (G.126) were studied and the obtained results are shown in table (7).

It could be noticed that, protein content in the flour of whole grain meal of new hull-less barley variety (G 135) was higher than that of each of the three released hull-less barley cultivars (G.129, G.130, G.131) and the released hulled barley cultivar (G.126).

Amino acid lysine content in G135 barley flour was lower (0.34%) than the other barley flour cultivars except (G.126) barley flour (0.32%). Fiber content of G.135 barley flour (4.22%) was lower than G.129, G.130, G.131 and G.126 flours. The whole grain meal flour of the new hull-less barley variety G.135 has the highest percent of Lipeds (1.60%) and Ash (3.01%) compared with (G.129, G.130, G.131 and G.126).

These results show the importance of G.135 as a new barley variety for food and feed due to its nutritional value compared with the hulled barley variety G.126 in addition to the advantage of its easy thrash ability.

Fingerprinting

In RAPD analysis, a total of 37 bands was detected, among which 9 bands 18.91%) were polymorphic. For each primer, the number of bands ranged from 4 to 6, with an average

of 4.6 (Table 8). DNA profiling was used for fingerprinting the Giza 135 variety along with the two check varieties; Giza 129 and Giza 131. Figure (1) and Table(9).

Table (7): Percentages of protein, lysine amino acid, lipids, fibers, ash and humidity in whole grain meal of the new hull-less barley variety G.135 compared with the three released hull-less barley cultivars (G.129, G.130 and G.131) and the released hulled barley cultivar (G.126)

Variety	Protein%	Lysine%	Lipids%	Fibers%	Ash%	Humidety%
G.135	11.30	0.34	1.60	4.22	3.01	8.7
G.129	8.9	0.47	1.37	4.78	2.56	7.7
G.130	10.8	0.45	1.52	4.79	2.16	8.3
G.131	9.8	0.44	1.50	4.46	2.00	8.0
G.126	8.72	0.32	2.04	4.35	2.92	8.22

Table (8): Primer sequences, amplified bands and polymorphic bands in RAPD analysis.

Primer name	Primer sequences	Amplified bands	polymorphic bands
OPA-02	TGCCGAGCTG	4	0
OPA-09	GGGTAACGCC	5	1
OPA-19	CAAACGTCGG	6	1
OPD-02	GGACCCAACC	4	0
OPD-18	GAGAGCCAAC	4	3
OPD-20	ACCCGGTCAC	5	0
OPE-03	CCAGATGCAC	4	2
OPE-13	CCCGATTCGG	5	0

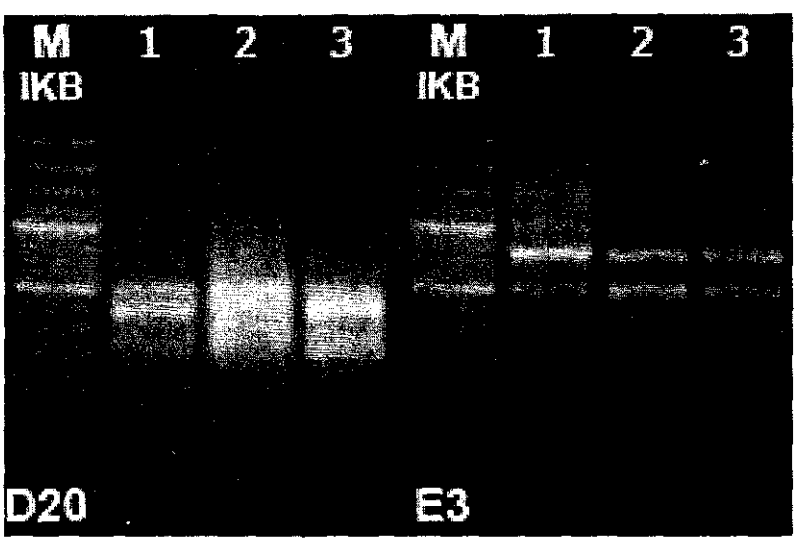

Figure (1): DNA banding pattern of the new variety Giza 135 using RAPD primers {OPD-20 and OPE-03}. M 1KB ladder, lane (1) G.135, lane (2)G. 129 and lane (3) G.131.

Table (9): DNA Profiling of Giza 135, Giza 129 and Giza 131 Hull-less Barley variety using RAPD markers.

Primer	Giza 135	Giza 129	Giza 131
A2	1	1	1
	1	0	1
	1	1	1
	1	1	1
	1	1	1
A9	0	1	1
	1	1	1
	1	1	1
	1	0	1
	1	1	1
A19	1	1	1
	1	1	1
	1	1	1
	1	1	1
	0	1	1
D2	1	1	1
	1	1	1
	1	1	1
	1	1	1
	1	1	1
D18	1	1	0
	1	1	0
	1	1	1
	1	1	1
	1	1	1
D20	1	1	1
	1	1	1
	1	1	1
	1	1	1
	1	1	1
E3	0	1	1
	0	1	1
	1	1	1
	1	1	1
E13	1	1	1
	1	1	1
	1	1	1

CONCLUSION

This study showed the importance to register and release G.135 as new wide adapted hull-less barley cultivar to sustain barley production in Egypt and to assess in filling the gabe between cereal demand and production in the country.

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الملخص العربى

جيزة ١٣٥ صنف جديد واسع الأقلمة من الشعير العارى لجميع مناطق أنتاج الشعير بمصر*

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***ورقة مستخلصة من تقارير المشروع المصرى الأوربى للتنمية المستدامة لأنتاج الشعير تحت ظروف الزراعة المطرية.**

جيزة ١٣٥ صنف من الشعير العارى ذى الستة صفوف واسع الأقلمة أستنبطه " المشروع المصرى الأوربى للتنمية المستدامة لأنتاج الشعير تحت ظروف الزراعة المطرية بمصر" و يمكن أستخدام الصنف الجديد كغذاء أدمى صحى و علف حيوانى ويتميز الصنف الجديد بتحملة للجفاف حيث أثبت نجاحه تحت الظروف المطرية وفى الأراضى المروية تحت ظروف نقص الماء وهو صنف مبكر النضج ويتحمل النقص فى خصوبة التربة ومقاوم لأمراض الشعير(صدأ الاوراق، التبقع الشبكى، والتخطيط) و الدقيق الناتج منه ذو صفات تكنولوجية عالية.

أستنبط الصنف جيزة ١٣٥ بطريقة الأنتخاب التجميعى من الهجين

"ZARZA/BERMEJO/4/DS4931//GLORIA-BAR/COPAL/3/SEN/5/ANYAROSA"

المستورد من منظمة سيمت (برنامج الشعير لأيكاردا/ سيمت) وتم تقييم الصنف فى تجارب محصولية أولية(مصغرة) ومتقدمة (مكبرة) و تجارب مزرعية فى ثماني مواسم زراعية(٢٠٠٢/٢٠٠٣ ، ٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥ ، ٢٠٠٥/٢٠٠٦ ، ٢٠٠٦/٢٠٠٧ ، ٢٠٠٧/٢٠٠٨ ، ٢٠٠٨/٢٠٠٩ ، ٢٠٠٩/٢٠١٠) و ذلك فى الأراضى المروية فى ١٨ تجربة محصولية و كذلك تم زراعتة فى الأراضى المطرية فى خمس مواسم زراعية (٢٠٠٢/٢٠٠٣ ، ٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥ ، ٢٠٠٥/٢٠٠٦ ، ٢٠٠٦/٢٠٠٧ ، ٢٠٠٧/٢٠٠٨) فى ٧ تجارب محصولية . تفوق الصنف الجديد (جيزة ١٣٥) على صنف المقارنة ١٢٩ فى محصول الحبوب تفوقاً معنوياً بمقدار٣٨,٦ % وذلك فى الزراعة المروية. أما بالنسبة لزراعة الصنف الجديد (جيزة ١٣٥) على الأمطار فقد أظهر تفوقاً معنوياً على صنفى المقارنة جيزة١٢٩ وجيزة ١٣٠ بمقدار ١٣,١ % ، ٢٦,٦ % على التوالى فى محصول الحبوب. وأظهرت الدراسة أنة ذو قدرة عالية على الثبات الوراثى و الصنف أظهر مقاومة لأمراض الشعير الرئيسية بمصر. أظهرت الدراسة أن الصنف جيزة ١٣٥ أعلى فى محتوى دقيق الحبة لكل من البروتين الكلى والدهون و الرماد بالمقارنة بأصناف الشعير العارى الثلاثة جيزة ١٢٩ ، جيزة ١٣٠ ، جيزة ١٣١ و أعلى فى محتوى الحبة الكلى من البروتين و الحمض الأمينى "الليسين" والرماد عن نظيرتها فى صنف الشعير المغطى جيزة١٢٦ و يوصى البحث بنشر الصنف جيزة ١٣٥ لزراعتة بمناطق انتاج الشعير و أستخدامة كغذاء أدمى صحى للمشاركة فى سد الفجوة بين الأنتاج و الأحتياجات القمحية بمصر.تم عمل بصمة وراثية للصنف جيزة ١٣٥ بطريقة المعلمات الجزئية RAPD markers