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EHR3 (EGYPTIAN HYBRID RICE 3): A NEW HIGH YIELDING HYBRID VARIETY OF RICE

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ABSTRACT

EHR3 (SK2151H), a short duration high yielding rice hybrid was developed through the hybridization between the CMS line Sakha1A and the restorer variety GZ9057-6-3-3-1 (Giza179) (Sakha1A × Giza179R) at hybrid Rice Research Program, Rice Research and Training Center, Sakha, Kafr El-Sheikh, Egypt and released by varieties release committee, Egypt, in 2018 for cultivation. This rice hybrid has been nominated as SK2151H then Egyptian Rice Hybrid 3 (EHR3). Before release as "EHR3", it had completed four years (2013 through 2016) of National testing in the designation of SK2151H. EHR3 (SK2151H) had shorter growth duration (130.8 days) than EHR1 (134.9 days), Giza 178 (135 days), Sakha 101 (142.9 days) and Sakha 104 (135 days). In addition, it had heavy panicle weight (5.99 g), more number of spikelets and filled grains panicle^{-1}. It gave 13.54 t/ha of grain yield with yield advantage of 3.14, 3.24, 3.26 and 3.35 t/ha with a superiority % of 30.19, 31.45, 31.71 and 32.87% over the commercial inbred rice cultivars, Giza 178, Giza 179, Sakha 101 and Sakha 104, respectively. The new rice hybrid EHR3 showed better grain quality attributed compared with, EHR1, Giza 178 and Giza 179 and hence, world have a better chance in consumers preference. Altogether with high yield potential and other agronomic performance it will have a good rank among commercial rice varieties. Tests conducted at plant protection program proved that the new rice hybrid EHR3, is resistant to blast and moderately resistant to stem borer.

Key words: ***Egyptian Rice Hybrid, CMS line, Restorer***

INTRODUCTION

Rice (*Oryza sativa* L.) is considered the second main food cereal crop after wheat, for Egyptian production. The area cultivated annually to rice in Egypt is about 0.6 million ha until 2017 and decreased to 0.32 million ha in 2018, all under irrigation ecosystem.

Among the many genetic approaches being explored to break the yield barrier in rice production and productivity, hybrid rice technology is one of the potential options for increasing rice production and productivity; it has been widely acclaimed and accepted to enhance genetic potential (Chen *et al* 2007). Hybrid rice technology has helped to increase yield potential in rice by 15-20% (1-1.5 t/ha) beyond the yield of inbred high-yielding varieties (HYVS) by exploiting the phenomenon of hybrid vigor. The increased yield per unit area per unit time is required to meet increased

future rice demand from less land with less water and less labor (Virmani 2005).

Commercial success of hybrid rice technology in China has clearly shown in potential of this technology to meet the ever increasing demand for rice the world over. Efforts to develop and use this technology in Egypt, though initiated in 1982, have been systematized and intensified since 1995, with launching of mission oriented project by cooperation between Rice Research Programme of Egypt and International Rice Research Institute (IRRI). The Hybrid Rice Research Program then retained to give more chance for improving rice productivity and production through the development of new improved hybrid and inbred varieties (Maximos and Aidy 1994, Bastawisi *et al* 1998, El-Mowafi 2001, El-Mowafi and Abo-Shousha 2003, Bastawisi *et al* 2005, El-Mowafi *et al* 2005 and El-Mowafi *et al* 2009). We report here the development of new rice hybrid 3 a new hybrid rice variety with special emphasis on its main performance and superiority over local inbred and hybrid checks.

MATERIALS AND METHODS

In 2008, thirteen CMS lines and their maintainers were planted in isolated plot for crossing including the CMS line IR69625A and its maintainer IR69625B. The CMS lines were crossed with 100 elite genotypes grown in source nursery. These elite genotypes were selected to fulfill all breeding objectives. Source nursery was grown in 3 different sowing dates to synchronize flowering time with the CMS lines. They were planted in single row of 25 hills (5m long). To identify the fertility of F_1 hybrids and to screen for restoring ability, testcross nursery was grown in 2009. A total of 100 hybrids for CMS line IR69625A were planted in single rows with25 plants in each row (5 m length). A normal inbred check (Giza178) was grown every 20 rows (hybrids) for comparison.

If the F_1 of a certain hybrid combination shows male sterility and its male parent had acceptable agronomic performance, such F_1 could be developed as a CMS line by successive backcrosses. On the other hand, male parents of the testcross F_1s that showed normal spikelet fertility are designated as potential restorers. The hybrid combination IR69625A × GZ9057-6-3-3-1 showed normal spikelet fertility and was more productive than the male parent and the check variety included the test cross nursery. Also, the line GZ9057-6-3-3-1 (male parent)had excellent agronomic performance in both normal and stress conditions (data not shown) and was released as the inbred variety Giza 179. Seeds of this restorer (GZ9057-6-3-3-1) was harvested and kept for producing experimental hybrids. This cross (IR69625A × GZ9057-6-3-3-1) was marked as potential hybrid for further evaluation in observational yield trials. Diagram and time sequence of the hybrid rice combination SK2151H (EHR3) are shown in fig.1 and 2.

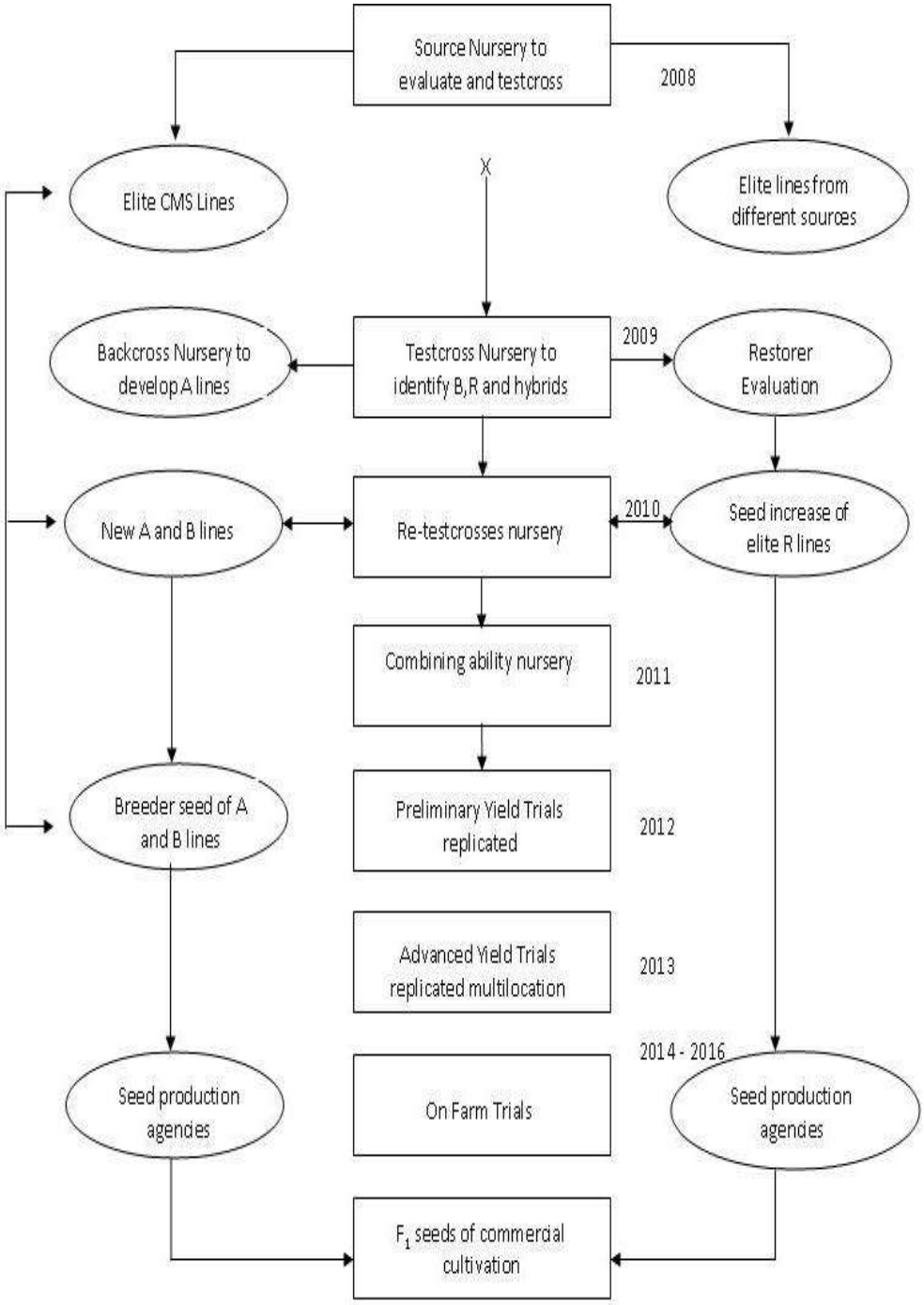

Fig. 1. Diagram and time sequence of the new hybrid released EHR3 (SK2151H).

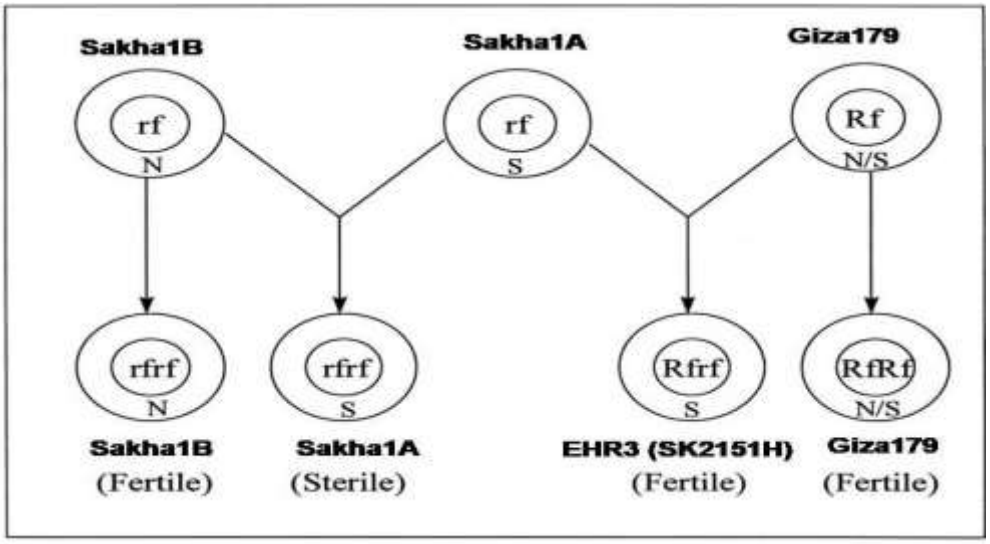

Fig. 2. Breeding scheme and work plan used for developing and evaluation of the new hybrid (EHR3) and its parental lines.

Re-testcross nursery and combining ability nurseries (2010)

To identify and confirm restoring ability of the male parent, re-testcross nursery was grown in 2010 season. About 150 plants from this hybrid combination were grown, along with the standard commercial check variety Giza 178. A preliminary observation of the heterosis in this F_1 was estimated. The hybrid combination Sakha1A x GZ9057-6-3-3-1 had again normal seed setting and was superior to the check variety Giza 178. The male parent was confirmed to be a good restorer line. ThisF_1 combination exhibited high heterosis estimates, thus, this combination successfully proved its superiority and passed through into the next stage of evaluation.

Combining ability nursery (2011)

This hybrid combination (IR69625A × GZ9057-6-3-3-1), along with others made from crosses between various CMS and restorer lines were planted in the combining ability evaluation nursery. This nursery was designed to identify the best CMS and restorer lines that had a good combining ability as well as better hybrid combinations. Each combination was planted in three replication plots, with seven rows each (5 m length) and single seedling hills. The standard commercial variety Giza178 was used as control. The hybrid combination IR69625A × GZ9057-6-3-3-1proved to have high specific combining ability and hence, was considered as a good hybrid candidate and promoted to the next cycle of evaluation.

Preliminary yield trial (PYT, 2012)

The selected promising hybrid (IR69625A × GZ9057-6-3-3-1R) with other promising hybrid combinations were evaluated in a replicated yield trial with four replications in RCBD. The plot size was 12 m^2(25

single seedling hills × row, 12 rows). Yield estimated was recorded on 10 m^2. The standard commercial check variety Giza 178 was used as control. This trial was conducted in 2012 season. Based on visual observation and analysis of their agronomic characteristics, grain yield, grain quality and disease and insect resistance, the hybrid (IR69625A × GZ9057-6-3-3-1) was recommended for the advanced or multi-location yield trial.

Advanced (Multi-location) yield trials (2013)

The promising hybrids, including (IR69625A × GZ9057-6-3-3-1) were evaluated in a multi-location yield trial to access their performance, yield potential and stability across various environments. This trial was conducted in four locations Sakha, Gemmiza, Zarzoura under normal soil conditions and El Sirw under saline soil conditions. Experimental design was similar to that of the preliminary replicated yield trial, but the multi-location trial was strictly carried out according to standard regulations. Simultaneously, the cultural practices and seed production package were also studied.

Promising rice hybrids were evaluated in combining ability, preliminary and yield trials carried out at Sakha experimental station. EHR3 (SK2151H) with promising rice hybrid combinations and local inbred check varieties were evaluated in advanced or multilocation yield trials carried out at the three experimental stations, Sakha and Gemmiza under normal conditions and El-Sirw under saline conditions. Trials were laid out ‘in a randomized complete block design with four replications for all experiments. The data were subjected to statistical analysis according to Gomez and Gomez (1983). Moreover, the tests have been conducted under verification and on farm trails from 2014 to 2016 seasons. The main characteristics of the EHR3 and the local inbred check varieties are presented in Table (1).

Table 1. Mean performance of tested hybrid SK2151H for grain yield, biotic stress resistance and quality parameters compared with check inbred cultivars.

Characteristic	SK2151H	Giza178	Giza179	Sakha101	Sakha104
1-Yield average (t/ha)	13.549	10.403	10.313	10.284	10.196
2-Yield advantage (t/ha)	-	3.146	3.236	3.265	3.353
3-Superiority %	-	30.24	31.48	31.75	32.89
4-Growth duration (day)	130	135	129	142	135
5-Blast resistance	R	R	R	S	S
6-Insect resistance	MR	MR	MR	R	R
7-Grain quality					
-Cargo rice%	80.25	79.3	-	-	-
-Milling rice %	67.95	67.4	-	-	-
-White rice %	58.75	56.9	-	-	-
-Amylose content%	21.45	17.0	-	-	-
-Cooking quality	Good	Good	-	-	-

RESULTS AND DISCUSSION

Yield performance across the two normal soil locations, Sakha and Gemmiza was shown in Table (2) which indicated that the increment of yield during 2013 for the Egyptian rice hybrid 3 (EHR3) was about 2.83 tons over the local inbred variety Giza178 and 2.81 tons more than Sakha 101. Similar results were obtained for the new hybrid rice combination EHR3 during 2014, 2015 and 2016 which had higher productivity the four local inbred varieties; Giza178,Giza 179, Sakha 101 and Sakha 104. On the other hand, under saline soil conditions, the highest grain yield (ton/ha) was obtained from the hybrid rice combinations, EHR1 and EHR3 in Sirw location.

Table 2. Mean yield performance (t/ha) of EHR3 (SK2151H) and checks under normal (Sakha) and saline (Sirw) soil conditions.

Year	Hybrid/variety	Normal soil		Average	Saline soil ECe = 8-10 mmohsEl-Sirw
		Sakha	Gemmiza		
2013	SK2151H (EHR3)	13.368	13.287	13.328	7.190
	EHR1	14.225	13.508	13.867	7.696
	Giza 178	10.431	10.565	10.498	6.845
	Giza 179	10.369	10.675	10.522	6.596
	Sakha 101	10.472	10.606	10.539	4.778
	Sakha 104	9.703	10.430	10.067	4.986
	L.S.D 0.05	0.217	0.163		0.189
2014	SK2151H (EHR3)	13.526	13.074	13.300	6.798
	EHR1	13.923	13.318	13.621	6.895
	Giza 178	10.234	10.623	10.429	6.410
	Giza 179	10.360	10.621	10.491	6.598
	Sakha 101	10.194	10.524	10.359	5.370
	Sakha 104	10.393	10.458	10.426	5.845
	L.S.D 0.05	0.430	0.136		0.243
2015	SK2151H (EHR3)	13.733	13.108	13.421	6.760
	EHR1	13.709	13.318	13.514	7.451
	Giza 178	10.401	10.599	10.500	5.768
	Giza 179	9.901	10.630	10.266	5.546
	Sakha 101	10.234	10.653	10.444	4.700
	Sakha 104	10.305	10.545	10.425	5.128
	LSD 0.05	0.240	0.226		0.217
2016	SK2151H (EHR3)	13.566	13.250	13.408	6.778
	EHR1	15.137	13.399	14.268	7.125
	Giza 178	10.543	10.658	10.601	5.905
	Giza 179	10.591	10.544	10.568	5.680
	Sakha 101	10.234	10.573	10.404	4.968
	Sakha 104	10.377	10.565	10.471	5.518
	L.S.D 0.05	0.280	0.205		0.173

Some morphological and agronomic characters

EHR3 (SK2151H) had shorter growth duration (130.8 days) than EHR1 (134.9 days) Giza 178 (135 days), Sakha 101 (142.9 days) and Sakha 104 (135.66 days) (Table 3). This trait is very important because it allows for irrigation water saving. In addition, the new hybrid had heavy panicle weight (5.99 g), and more number of spikelets and filled grains panicle^{-1}. It gave 13.54 t/ha of grain yield with yield advantage of 3.14, 3.24, 3.26 and 3.35 t/ha and percentage superiority of 30.19, 30.45, 31.71 and 32.87% over the commercial inbred rice cultivars, Giza178, Giza179, Sakha101 and Sakha104, respectively.

Table 3. Means of morphological and agronomic characteristics of EHR3 and other commercial rice cultivars.

Character	EHR3 (SK2151H)	EHR1	Giza178	Giza179	Sakha101	Sakha104
Growth duration (day)	130.82	134.90	134.99	129.11	142.90	135.66
Plant height (cm)	104.37	106.37	100.37	97.57	97.83	112.20
Panicle length (cm)	24.58	25.24	23.56	23.81	23.39	23.98
Panicles plant^{-1}	24.37	22.71	22.28	23.81	21.09	21.14
Panicle weight (g)	5.99	6.32	4.68	5.17	4.37	4.32
Spikelets panicle^{-1}	218.36	248.90	174.07	181.76	160.78	157.43
Filled grains panicle^{-1}	200.90	208.53	164.53	172.27	151.83	146.06
Spikelet fertility%	92.05	83.06	94.56	94.81	94.45	92.77
1000-grain weight (g)	27.28	26.45	21.21	27.30	29.36	29.14
Panicle type	Dropping	Dropping	Dropping	Dropping	Dropping	Dropping
Panicle exertion	100%fully	100%fully	100%fully	100%fully	100%fully	100%fully
Average yield (t/ha^{-1})	13.54	14.25	10.40	10.30	10.28	10.19

Grain quality of SK2151H (Egyptian Hybrid 3), proved to be acceptable compared with Egyptian hybrid 1 and Giza 178 check variety as average of 2015 and 2016 evaluations. SK2151H (Egyptian Hybrid 3) had 19.75% of husks, Cargo (brown rice) was 80.25% compared with 79.7% and 79.3 for ERH1 and Giza 178, respectively. Milled rice (white + broken

rice) recorded 67.95%, which is higher than both studied checks, with broken rice of 9.2% and white rice of 58.75%. Bran and germ % of the new hybrid reached 12.3%, making it a good candidate for industrial production of secondary products.

Cooking qualities of SK2151H (Egyptian Hybrid 3) support its superiority. Gel consistency was 98 mm, gelatinization temperature was 75^0C, with about one third kernel elongation and 26.5 min cooking time. Also, Amylose content of the new hybrid was 21.45, which was slightly lower than ERH1. The recorded values were in the same range, if not better, than the two studied checks (Table 4).

Table 4. Grain quality, cooking tests and sensory evaluation of the new hybrid combination SK2151H compared by EHR1 and Giza 178 during 2015 and 2016 seasons.

Trait	EHR3 (SK2151H)		EHR1		Giza178	
	2015	2016	2015	2016	2015	2016
Rice grain and cooking quality						
Husk%	19.7	19.8	21.2	19.3	20.6	20.8
Cargo%	80.3	80.2	78.8	80.7	79.4	79.2
Milling (white + Broken)%	68.6	67.3	69.7	68.3	66.8	68.0
Broken%	9.3	9.1	9.0	9.1	10.0	11.0
White%	59.3	58.2	60.7	59.2	56.8	57.0
Bran and Germ%	11.7	12.9	9.1	12.4	12.6	11.2
Gel Consistency (G.C.)	98	98	98	98	80	80
Gel Temperature (G.T.)	$>75^o$	$>75^o$	$>75^o$	$>75^o$	$>75^o$	$>75^o$
Kernel Elongation %	26.3	30.6	31.7	31.5	33.9	32.6
Cooking time (min.)	26.0	27.0	27.0	26.0	26.0	27.0
Amylase content	21.6	21.3	21.0	21.8	16.7	17.3
Sensory Evaluation						
Color	8.0	8.0	9.7	9.0	8.0	8.0
Taste	8.0	8,5	8.5	8.0	9.0	9.0
Order	8.0	8.3	8.9	8.0	9.0	8.5
Texture	7.0	7.0	7.6	7.0	8.0	8.0
Overall acceptability	7.0	7.0	8.5	8.0	8.0	8.0

Sensory evaluation of cooked rice of SK2151H (Egyptian Hybrid 3) showed also a good acceptability. Color score was 8, same as Giza 178, taste scale was 8.25. Order score of cooked grains was 8.15, lower than both checks (8.45 and 8.75, for ERH1 and Giza 178, respectively). Texture of cooked rice was fluffy with a score of 7 compared with 7.3 and 8 for the two checks, in respective order, the overall acceptability had a score of 7 compared to 8.25 and 8 for ERH1 and Giza 178, respectively.

In conclusion, the new hybrid EHR3 (SK2151H) showed a better quality attributed compared with EHR1, Giza178 and Giza179 and hence, world have a better chance in consumers preference. Altogether with high

yield potential and other agronomic performance, EHR3 will have a good rank among commercial rice varieties.

Disease resistance tests

Blast

The rice hybrid EHR3 was tested under different test conditions for blast resistance, i.e. blast nursery test under field conditions and greenhouse test. The blast nursery was tried at two test locations, Sakha and Gemmiza, to evaluate seeding reactions (Sehly *et al* 1990). In addition, greenhouse test using 15 single spore isolates collected from different locations was carried out to evaluate and specify the number of virulent races compared to the check cultivars (Sehly and Bastawisi 1995 and El-Shafey *et al* 2015).

Results in Table (5) indicated that EHR3 was resistant under blast nursery test at the two test locations in the period from 2013 to 2016, while the two check cvs. Sakha 101 and Sakha 104 were susceptible.

Table 5. Blast reaction of EHR3 (SK2151H) compared to EHR1 and local inbred varieties.

Variety × hybrid	Blast nursery		Blast reaction under artificial inoculation														
	Sa.	Gem.	1A-111	1B-3	1B-4	1B-15	1B-47	IC-9	IC-11	IC-13	IC-15	ID-3	ID-11	ID-15	IG-1	IH-1	II	R%
SK2151H (EHR3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	100
EHR1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	100
Giza178	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	100
Giza179	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	100
Sakha101	S	S	S	R	R	S	S	R	S	S	S	HS	HS	S	R	R	R	27
Sakha104	S	S	R	S	R	R	R	R	S	S	S	HS	HS	S	R	R	R	40

Sa. = Sakha, Gem = Gemmiza, R= Resistance, S= Sensitive, HS=Highly Sensitive

No single isolate from the 15 ones tested in the greenhouse, proved to be virulent on EHR3, while 11 and 9 isolates were able to infect both Sakha 101 and Sakha 104 varieties, respectively (Table 6).

Table 6. Evaluation of EHR3 rice hybrid against 15 isolates of *Magnaporthe grisea* under greenhouse condition.

Cultivar	No. of virulent isolates	No. of avirulent isolates
SK2151H (EHR3)	0	15
EHR1	0	15
Giza178	0	15
Giza179	0	15
Sakha101	11	4
Sakha104	9	6

The overall results from the two tests exhibited high level of blast resistance in EHR3, EHR1, Giza 178 and Giza 179 compared with Sakha101 and Sakha 104. However, by the increase of the area of hybrid rice combination such as EHR1 and EHR3 and decrease the area of Sakha101 and Sakha 104, it is recommended to monitor the appearance of any disease symptom in addition to increase the productivity and production.

Brown spot disease

EHR3 showed a good level of resistance to brown spot disease.

Resistance to insects

Rice stem borer

Rice stem borer, *Chilo agamemnon* attacks rice plants causing "dead hearts" during vegetative stage, and "white heads" during reproductive stage. Most damage is due to white heads, because rice plants compensate for injury occurring during early stage of the plant. EHR3 was moderately resistant to the stem borer (Table 7).

Table 7. Susceptibility of hybrid and inbred rice cultivars to rice stem borer expressed as white heads %.

Variety/Hybrid	Stem borer damage %				Mean	*Category
	2013	2014	2015	2016		
SK2151H (EHR3)	5.79	5.68	5.94	4.95	5.59	MR
EHR1	7.35	6.63	6.95	6.98	6.98	MS
Giza 178	8.10	8.25	7.80	8.28	8.11	S
Giza 179	5.89	6.25	5.85	5.90	5.97	MR
Sakha 101	3.53	3.98	3.67	3.40	3.65	R
Sakha 104	3.70	3.53	3.85	3.58	3.67	R

*** Category: High Resistance (HR); 0-2, Resistance (R); 2.1-4, Moderate Resistance (MR); 4.1-6, Moderate Susceptible (MS); 6.1-8, Susceptible (S); 8.1-10, and Highly Susceptible (HS); >10**

2. Rice leaf minor

Worldwide, number of rice varieties resistant to the rice leaf miner are very few (Meneses Carbonell and Cordero, 1993). The evaluation indicated that EHR3 is moderately resistant to this insect.

Seed production

Seed increases of rice hybrids has been started in 2005 with increase of the CMS, maintainer (B), and restorer lines. The hybrid (EHR3) can offer surplus production for both local demand and exportation. Increasing area in the coming years will be an urgent need for rice growers.

Molecular Profiling

Molecular profiling of the new hybrid was carried out to create a distinct pattern of the new hybrid at the molecular level. Ten mer random

RAPD (random amplified polymorphic DNA) primers were used to generate this profiling pattern. Fig (3) and Table (8) shows the banding patterns of the ten primers and generated bands molecular sizes from each primer. The number of amplified fragments ranged from 3 in the Primers O18 and O19 to 7 in case of A17 and G16. The amplified band sizes ranged from 250 bp in the primers C02, G10 and G16 to 1937 bp in primer C15 which produced the widest range of amplified bands among tested primers. This unique profiling is essential to protect intellectual property rights and breeder rights. It is clear-cut evidence if any dispute that might raise concerning this new variety and among the essential requirements for new varieties registration.

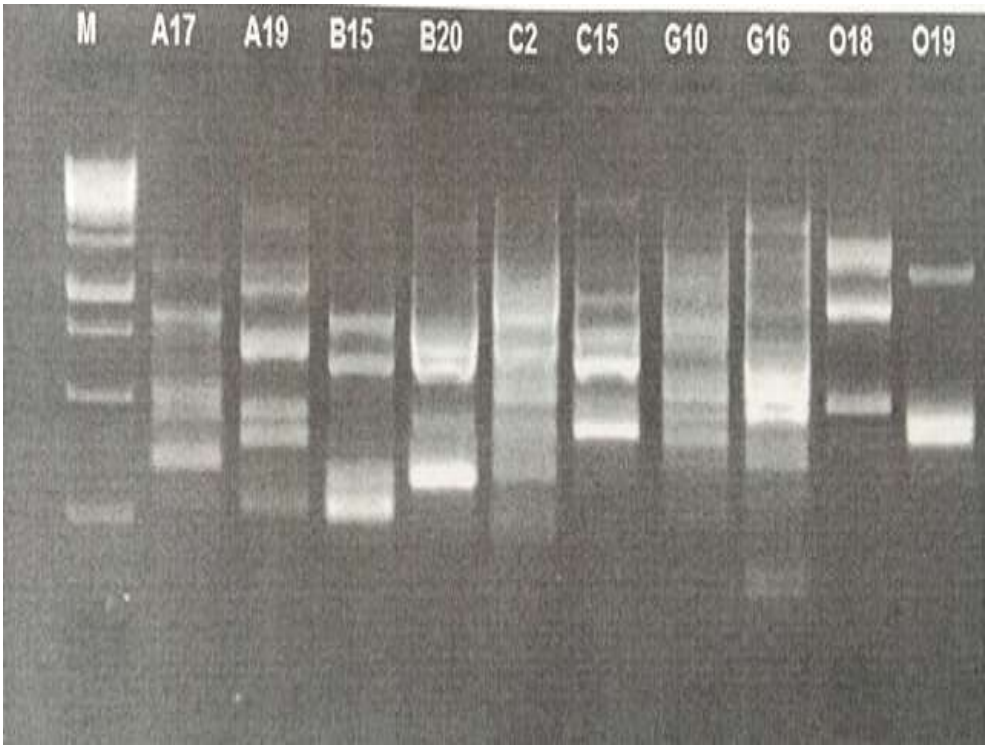

Fig. 3. Banding patterns of the ten primers.

Table 8. Generated bands molecular sizes from each primer.

A17	A19	B15	B20	C02	C15	G10	G16	O18	O19
1250	1789	819	1705	856	1937	1385	1760	1527	1275
819	1063	607	706	670	1020	888	1019	957	801
509	677	325	598	516	738	587	612	492	442
492	456	262	387	429	617	463	525		
442	385		315	335	409	403	463		
345	266			250		250	351		
274							250		

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هجين مصري ٣: صنف أرز هجين جديد عالي الإنتاجية

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٢. معهد بحوث وقاية النباتات ،مركز البحوث الزراعية ، مصر.

٣. قسم بحوث الذرة الشامية ، معهد بحوث المحاصيل الحقليه ، مركز البحوث الزراعية ، مصر.

لزيادة إنتاج الأرز في مصر مباشرة ومواجهة مشكلة نقص الموارد المائية والأرضية لزراعة الأرز يتم استنباط أصناف وهجن مصرية غير تقليدية عالية المحصول مبكرة النضج . تم إستنباط هجين مصري ٣ بالطريقة المتعارف عليها دوليا في تعرف وإستنباط وإختبار الهجن في حقول المقارنة المحصولية. تم تعريف هجين مصري ٣ والأب المعيد لخصوبتهGZ9057-6-3-3-1 (جيزة ١٧٩) من خلال التهجين بين الأم عقيمة الذكر (CMS) وراثيا سيتوبلازميا Sakha1A والأب المعيد لخصوبتها GZ9057-6-3-3-1 والذي تم تعريفهما عام ٢٠٠٩ في حقل الهجن الإختبارية وحقل الإعادة عام ٢٠١٠ من خلال برنامج الأرز الهجين بمركز البحوث والتدريب في الأرز بسخا – كفر الشيخ. تم اتباع الخطوات الدولية المتعارف عليها لإختبار الهجن حتي مرحلة التسجيل في لجنة تسجيل الاصناف. تم مقارنة هجين مصري ٣ (سخا ٢١٥١ هجين) بالأصناف والهجن التجارية عالية المحصول هجين مصري ١، جيزة ١٧٨، جيزة ١٧٩، سخا ١٠١ و سخا ١٠٤ خلال سنوات الإختبار في الأعوام ٢٠١٣ وحتي عام ٢٠١٦ في تجارب المقارنة المحصولية التي تم تنفيذها في مزارع محطات البحوث الزراعية بسخا والجميزة تحت ظروف الأراضي العادية والسرو تحت ظروف الأراضي الملحية وكذلك التجارب التأكيدية بحقول المزارعين بمحافظات زراعة الأرز الرئيسية. أظهرت النتائج أن الهجين SK2151H يتميز بالنضج المبكر (١٣٠,٨ يوم) بالمقارنة بهجين مصري ١(١٣٤,٩ يوم) ، جيزة ١٧٨ (١٣٥ يوم) ، سخا ١٠١ (١٤٢,٩ يوم) وسخا ١٠٤ (١٣٥ يوم) كما أظهرت النتائج تفوق الهجين الجديد (هجين مصري ٣) حيث أعطي محصول ١٣,٥٤ طن للهكتار بزيادة محصولية ٣,١٤، ٣,٢٤، ٣,٢٦ و ٣,٣٥ طن × هكتار بنسبة تفوق ٣٠,١٩ ، ٣١,٤٥ ، ٣١,٧١ و ٣٢,٨٧% علي الأصناف التجارية التقليدية جيزة ١٧٨، جيزة ١٧٩، سخا ١٠١ و سخا ١٠٤ علي التوالي. وأوضحت إختبارات الجودة أنها جيدة بالمقارنة بالأصناف هجين مصري ١ ، جيزة ١٧٨ و جيزة ١٧٩. كما أوضحت إختبارات برنامج الوقاية أن الصنف الهجيني الجديد هجين مصري ٣ مقاوم لمرض اللفحة ومتوسط المقاومة للثاقبات.

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