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Evaluation of Some New Rice Genotypes as Compared with Giza 177 Cultivar for Yield Traits and Grain Quality

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ABSTRACT

Two field experiments were conducted at the Agricultural Research Station, Alexandria University, during the two summer seasons 2023 and 2024. The main objective of the present study was to evaluate five new rice lines 1, 2, 3, 4, 5 and Giza 177 as a control variety in a randomized complete block design, in both seasons. The genotypes differ in plant type, time of maturity, productivity and grain quality. The results indicated that the Line No.1, gave the highest values for grain yield, (10.80 and 10.74 t/ha), number of ear-bearing tillers/ m^2(447 and 442 tillers) and amylose content (22.8 and 22.2 %), also it was significantly highest in number of grains per panicle (230 and 216 grains), panicle length (26.50 and 26.30 cm) and protein content (8.30and 8.50 %), in the two seasons, respectively. In the meantime, the line No.5 recorded the highest of grain yield (10.70 and 10.60 t/ha) and number of ear-bearing tillers/ m^2 (475 and 469 tillers) and as well it was significantly highest in 100 grain weight (3.93 and 3.95 g), in the two seasons, respectively. The results also revealed that there were significant differences among the lines No. 3, 4, and 5 in the duration of maturity since they were the significantly earliest. Regarding line No. 2, the results indicated a non-significant increase in total milled rice % in the two seasons 2023 and 2024.

INTRODUCTION

Rice (Oryza sativa L.) is one of the most important food products for more than 50% of the world's population (Atera *et al.*, 2018).Rice is a staple crop for billions of people worldwide, providing a significant source of nutrition and livelihood. It provides up to 50-80% of Asia's residents' calories, protein, and minerals (Anders *et al.*, 2021). The development of new rice varieties with enhanced yield and agronomic traits is crucial for ensuring food security, improving crop productivity, and adapting to changing environmental conditions. In Egypt, rice is one of the most important crops, in addition to wheat and maize, as a cereal crop. The area planted with rice in Egypt is about 0.46 million hectares (1.1 million feddans). The total production of rice has increased from 4.67 to 4.89 million tons in 2023-2024. Accounting for 10% of the cultivated area, rice constitutes 25% of the nation's food grain production (Kubo *et al.*, 2004).

Actually, Egypt is the only country in the region that is self-sufficient in its rice requirements with a sizeable surplus (0.4-0.8 million tons) for export. This impressive production growth has been possible because of an adequate policy environment and timely intervention with progressively improved technologies to cope with changing national and international needs and priorities. Developing high-yielding and resilient rice varieties is essential for meeting the food demands of a growing population. In addition, new rice varieties can contribute to sustainable agriculture practices by reducing the need for chemical inputs and improving resource use efficiency. Moreover, evaluating rice varieties for their adaptability to changing environmental conditions is critical for ensuring crop resilience and productivity in the face of climate change. There is strong competition between rice and other summer crops for the limited amount of water available in Egypt. Egyptian farmers and exporters consider rice as more profitable because of its high productivity and good grain quality. Extensive Egyptian breeding programs were undertaken and resulted in many rice varieties. These new varieties were selected on the basis of superiority in grain yield, resistance to prevalent diseases, early maturity, and excellent milling and grain quality. In addition, evaluation of the Egyptian rice quality was also considered in the breeding programs; such evaluation involves many aspects, i.e., physical characters such as grain dimensions, milling recovery, chemical composition and cooking and eating quality traits. High yield and superior quality have always been the main goals of rice breeding and basic research (Gong *et al.*, 2023). Furthermore, rice grain yield, agronomic and grain quality characteristics show a large amount of variability among and, even, within lines, depending upon the genetic make-up and the suitable agricultural practices. The heading time is an important agronomic trait affecting rice's growth, development, yield, and quality, thereby determining the adaptability and planting regions of rice varieties (Xue *et al.* 2008). Breeding for high yielding rice varieties with early maturity is considered important to increase cropping indices in the fully irrigated farm lands (Prasetiyono *et al.*

2014; Pramudyawardani *et al*.,2015). Therefore, the main goal of the present investigation was to evaluate new rice genotype characterized by the high yielding ability and desirable agronomic characteristics for the producers, and good cooking and grain quality characteristics and early maturity days for the Egyptian consumers.

MATERIALS AND METHODS

Two field experiments were conducted at the Agricultural Research Station, Faculty of Agricultural, Alexandria University, during the two summer seasons 2023 and 2024. The main objective of the present study was to determine the performance of five rice lines and control cultivar, which differed in plant type, time of maturity, productivity and grain quality.

The five rice genotypes, namely, Line No. 1, 2, 3, 4, and No. 5, were provided by the Rice Research Program, Crop Science Department, Faculty of Agriculture, Alexandria University. In addition to using the Giza 177 cultivar as a check variety. They were arranged in a randomized complete block design, with three replications, in both seasons. The following are the main characteristics of each line:

1- Line No. 1: It is a new basmati-type line, selected from the cross, IR 1929- 192× IR 10176-79, by the Rice Research Program since 1995. It is still under registration by the Egyptian Ministry of Agriculture and Land Reclamation as a new cultivar. It has the advantage of genetic stability under Egyptian conditions, extra-long and slender grains (like Basmati type cultivars), short stature, high tillering capacity, and high resistance to blast, brown spot, and false smut diseases.

2- Line No. 2 (E. wan No. 4): It was introduced from China in 1984 by the Academy of Scientific Research and Technology (ASRT) in Egypt. It was increased and planted under the Egyptian conditions by the Rice Research Program, Crop Science Dept., Faculty of Agriculture, Alexandria University. It is characterized by the new improved plant type characters, such as high-yielding ability, short stature, short grains, high resistance to blast and lodging, and excellent grain quality.

3- Lines No. 3 (Delfino) and Line No. 4: they were introduced from Italy by the Alexandria project and characterized by Medium Bold Grain Waxy and aromatic rice grain, and were increased by the Rice Research Program, Crop Science Department, Faculty of Agriculture, Alex. University, then they were planted under the Egyptian conditions. They were of early maturity (107 and 104 days, respectively), high-yielding ability, and high resistance to plant diseases.

4- Line No. 5: A new Alexandria rice line, which was derived by crossing between Giza 177 x Italian rice variety Baldo with early maturity (108 days) it is characterized by medium bold grains, resistance against blast and insects, and high grain quality.

The nursery seedbed and permanent field were prepared by mechanical plowing, harrowing, and leveling. Grains were soaked for two days (as of 10 May), followed by an incubation period of 2-3 days for seed germination initiation.

The nursery plot size was 3 × 3 = 9 m^2 for each Line, and plots were continuously kept flooded with water until transplanting time. The sprouted grains of each variety were directly broadcast by hand in the nursery at a seeding rate of 144 kg ha^{-1}.

Nitrogen, in the form of urea (46%), at the rate of 240 kg/ ha was directly broad casted on the dry-plowed soil of nursery and permanent field before flooding with irrigation water and puddling in the two seasons, as a deep application, according to the recommendations of the Rice National Campaign, Agriculture Research Center, Ministry of Agriculture and Land Reclamation.

Super phosphate (15.5% P_2O_5), at the rate of 240 kg ha^{-1}, was incorporated into the soil of nursery seedbed and permanent field during land preparation in both seasons. Also, zinc sulphate was applied to the nursery at the rate of 24 kg/ ha before broadcasting the soaked grains. Thirty-day-old seedlings, in both seasons, were transplanted in a permanent field. Each plot contained 15 rows, 20 cm apart, and 3-4 seedlings were put in each hill. Hill spacing was 20 × 15 cm. A knotted rope was used in maintain this spacing. The plot size was 3 × 3 = 9 m². The plots were continuously kept flooded with irrigation water throughout the growing season. As for the pest control, weeds were chemically controlled by using Machete 60% applied 4-7 days after transplanting. In some cases, weeds were manually controlled in the nursery and permanent field.

The measured characteristics, in the two seasons, were as follows:

1-Grain yield and its components characteristics:

1-**1Grain yield (t/ha):** 11 guarded rows were harvested for grain yield determinations. Plants were left for air-drying in the field, after which they were threshed by an experimental thresher. Grain yield was measured (in kilograms per plot) and was converted into tons per hectare, on a 15% moisture basis. The grain moisture percentage was determined by the Satake moisture meter.

1-2 - Number of ear-bearing tillers/ m^2: It was determined by counting the number of panicles in four random diagonal one-square-meter plots in guarded rows.

1-3- Number of grains per panicle: It was obtained from the average number of filled grains for three random panicles per plot

1-4- 100 - grain weight (g): It was recorded as the weight of 100 random rice grains per plot (average of two samples)

2- Agronomic characteristics:

2-1- Panicle length (cm): It was recorded as an average of three random panicles per plot. Measurements started from the peduncle node to the apiculus of the uppermost spikelets in each panicle.

2-2- Fifty-percent heading date (in days): It was determined by counting the number of days from sowing in the nursery till about 50 percent full panicle emergence from the flag leaf sheath.

2-3. Maturity date (in days): It was determined by counting the number of days from sowing in the nursery till harvest.

2-4- Plant height (cm): It was measured from the soil surface to panicle tips, just before harvesting. Three random diagonal heights were measured for each plot, and their averages were recorded

3- Milling out-turn characteristics:

3-1- Hull percentage: Two rough rice samples (100 g for each) were taken randomly from the original lot of each plot. Samples were cleaned and dehulled with an experimental Satake huller machine in the Rice Technology Laboratory (RT), Crop Science Dept., Faculty of Agriculture.

3-2- Brown rice percentage: Whole brown rice grains were separated from the dehulled rice. The amount of brown rice grains was weighed and recorded as a percentage of total weight.

3-3-Total Milled rice percentage: Brown rice samples were, consequently, milled in a satake miller. The milled rice samples were weighed, and the percentage of total milled rice was calculated.

4- Chemical components characteristics:

4-1- Protein content percentage: It was determined for brown rice, according to the standard micro-kjeldahl method. Then, the estimated nitrogen content was multiplied by a factor of 5.95 to estimate the crude protein content.

4-2- Amylose content percentage: It was estimated for milled rice; then, the rice varieties were grouped on the basis of the amylose content ratio, as follows:

7– 11 % very low amylose , 11 - 20 % low amylose

20– 25% intermediate amylose, >25%: high amylose.

RESULTS AND DISCUSSION

Results of the two experiments conducted for determining grain yield and its components, some agronomic and grain quality characters of some rice genotypes in 2023 and 2024 seasons are as follows:

1- Grain yield and its components:

The analysis of variance for **grain yield,** for the two seasons, is given in Table (1). The means of yield of the rice genotypes are presented in Table (2). In Table (1) grain yield was highly significantly affected by the rice genotypes, in both seasons. Data in Table (2) revealed that the overall mean values for grain yield of rice genotypes were significantly different from each other. This table, reveals that the rice lines No. 1 and 5, gave significantly the highest grain yield in the two seasons, compared to the other genotypes. The superiority of these two lines over the others might be attributed to their relatively higher number of ear-bearing tillers, number of grains/ panicle, and 100-grain weight (g). On the other hand, there were no significant differences among the other genotypes for this character.

Furthermore, it is observed in Table (2) that the mean grain yields of the rice genotypes were generally lower in 2024 than in 2023 seasons. Variation among genotypes for that trait were similar to the results of Tarang *et al.* (2013), Hussain *et al.* (2014),Al-Salim *et al.* (2016), Sadimantara *et al.* (2017) and Shrestha *et al*. (2021).

Regarding number of ear-bearing tillers/ m^2, the analysis of variance of this character, in the two studied seasons, are shown in Table (1), which indicated that the rice genotypes significantly affected the number of ear-bearing tillers per/ m^2. The mean values for this character as shown in Table (2), revealed that the lines No. 1 and 5 recorded significantly the highest number of ear-bearing tillers/m^2 in the two seasons than the other genotypes. While the result showed that no significant differences were observed among the remaining genotypes for number of ear bearing tillers/m^2 in the two seasons, respectively. Generally, the new rice lines produced higher number of ear-bearing tillers/ m^2 in the first than in the second season. Variations of this result were similar to the results obtained by Hussain *et al*. (2014), Al-Salim *et al*. (2016), Sadimantara *et al*. (2017), Shrestha *et al*. (2021) and Gawdiya *et al*. (2023).

Similarly, mean squares values for number of grains/ panicle, in the two seasons, are presented in Table 1, while Table 2 shows the mean numbers of grains/ panicle for rice lines, in 2023 and 2024 seasons. Data in Table (1) showed that this trait was significantly affected by the rice genotypes in the two seasons. Data in Table (2) showed that the rice line No. 1 gave the significant highest number of grains per panicle in both seasons (about 230 and 216) grains, in 2023 and 2024, respectively, because it gave the longest significant panicle in both seasons. While, the other genotypes showed no significantly values of this character in the two seasons, respectively. As mentioned before, the present character could be considered as another essential grain yield component in this study because it gave the same trend as that of grain yield. Variation among lines for number of grains/ panicle were similar to those reported by Akram *et al*.

(2007), Zhang *et al*. (2009) and Patel *et al*. (2012). Sadimantara *et al*. (2017) and Gawdiya *et al*. (2023).

Regarding the 100-grain weight, data in Table (1) reveal that the weight of 100 grains was significantly affected by the rice genotypes in this study in 2023 and 2024 seasons. Data in Table (2) show the mean weight of 100-grains of different rice genotypes. Line 5 was significantly higher than those of the other genotypes in the two seasons, being 3.93 and 3.95 (g), in 2023 and 2024, respectively. On the other hand, the line.1 (in the two seasons) had the least significant 100-grain weight, with mean values of 2.10 and 2.05 (g) in 2023 and 2024, respectively. Overall, the results indicated the superiority of the new rice lines 1 and 5 over the Giza 177 cultivar in yield and its components. This difference in this trait was in accordance with Akram *et al*. (2007), Tayefe *et al*. (2013), who found significant differences among rice cultivars. Also, Variation among lines for 100-grain weight were similar to those reported by Sadimantara *et al.* (2017), Subhalakshmi *et al.* (2018) and Khatibani *et al.*(2019).

2- Agronomic characteristics:

Data for panicle length and their analysis of variance are shown in Table (3) which indicated that panicle length was highly significantly affected by the rice genotypes. Mean in Table (4) showed that line No. 1 had significantly the longest panicles with values of 26.50 and 26.30 cm in 2023 and 2024 seasons, respectively. On the other hand, the other genotypes produced the significantly shortest panicles in the two seasons. These results suggested that panicle length might be taken as an important component of grain yield in the present study, since they took the same trend of grain yield. These differences among the genotypes were similar to those reported by Patel *et al.* (2012), Al-Salim *et al*. (2016), Sadimantara *et al*. (2017) and Shrestha *et al*. (2021).

Fifty-percent heading date: The mean squares values, in Table (3), showed that the 50 percent heading date was significantly affected by the rice genotypes in 2023 and 2024 seasons. The mean values for this trait are presented in Table (4), which indicated that the rice lines No. 3, 4 and line. 5 were significantly earlier lines in heading, in comparison with the other genotypes in the two seasons. On the other hand, line 1, line 2 and Giza 177 cultivar were the latest heading lines in the two seasons.

Variation among genotypes for that trait were similar to the results of Akram *et al.* (2007), Zhang *et al.* (2009), Chamling and Basu (2012), Geverk (2012) and Patel *et al.* (2012).

Regarding the maturity date, analysis of variance for this character, in Table (3), showed that the days to maturity were significantly affected by the rice genotypes in 2023 and 2024 seasons. The mean values for this trait are presented in Table (4), which indicated that the rice lines No. 3, 4 and 5 were significantly earlier in this character in the two seasons , in comparison with the other lines and Giza 177 cultivar.

Table 1: Analysis of variance for grain yield (t/ha),number of ear-bearing tillers/ m^2,number of grains per panicle and 100-grain weight in Genotypes of rice in 2023 and 2024 seasons.

Source of variation	Degrees of freedom	grain yield (t/ ha)		Number of ear-bearing tillers/ m^2		number of grains per panicle		100 - grain weight	
		2023	2024	2023	2024	2023	2024	2023	2024
BL	2	0.0009	0.010	131.3	344.6	3.23	27.2	0.002	0.003
Genotypes	5	12.08**	13.55**	16065**	17094**	4604**	5128.8**	0.73**	0.76**
Error	10	1.50	1.57	2250.9	2618.20	230	238	0.05	0.088
Total	17								

**, Significant at 0.01 level.

Table 2: Mean values for grain yield (t/ha), Number of ear-bearing tillers/ m^2 ,number of grains per panicle and 100-grain weight in Genotypes of rice in 2023 and 2024 seasons.

Genotypes	Grain yield (t./h.) (1)		Number of ear-bearing tillers/ m^2 (1)		Number of grains per panicle (1)		100-grain weight	
	2023	2024	2023	2024	2023	2024	2023	2024
Line No. 1	10.80 a	10.74 a	447 a	442 a	230 a	216 a	2.10 c	2.05 c
Line No. 2	7.10 b	7.00 b	300 b	289 b	133 b	131 b	2.75 b	2.88 b
Line No. 3	7.20 b	7.10 b	284 b	270 b	118 b	115 b	2.79 b	2.88 b
Line No. 4	7.30 b	7.10 b	308 b	297 b	112 b	108 b	2.95 b	2.90 b
Line No. 5	10.70 a	10.60 a	475 a	469 a	114 b	112 b	3.93 a	3.95 a
Giza 177	7.30 b	7.20 b	313 b	303 b	120 b	117 b	2.8 b	2.8 b
L.S.D.$_{0.01}$	3.17	3.24	122.8	132.4	39.3	39.9	0.58	0.77

(1) Means followed by the same letter are not significantly different but different letters are significant according to LSD 0.01 level of probability.

Table 3: Analysis of variance for panicle length (cm) ,50% heading date (in days),maturity date and Plant height (cm) in 2023 and 2024 seasons.

Source of variation	Degrees of freedom	panicle length (cm)		50% heading date (in days)		Maturity date		Plant height (cm)	
		2023	2024	2023	2024	2023	2024	2023	2024
BL	2	0.003	0.21	0.62	0.86	1.1	1.9	3.09	2.09
Genotypes	5	62.33**	66.94**	323.6**	341.6**	403.8**	456.9**	925.9**	812.7**
Error	10	2.2	2.5	35	38.4	48.2	43.7	74	67
Total	17								

**, Significant at 0.01 level.

Table 4: Mean values for panicle length(cm),50%heading date, maturity date and plant height (cm) of rice genotypes in 2023 and 2024 seasons.

Genotypes	panicle length (cm)		50% heading date (in days) (1)		Maturity date		Plant height (cm)	
	2023	2024	2023	2024	2023	2024	2023	2024
Line No. 1	26.50 a	26.30 a	96 a	95 a	128 a	128 a	116.5 a	116.8 a
Line No. 2	19.60 b	19.50 b	95 a	95 a	128 a	129 a	120.5 a	121 a
Line No. 3	15.30 c	15.10 c	77 b	77 b	107 b	108 b	85.5 b	86.70 b
Line No. 4	15.10 c	15.05 c	76 b	76 b	104 b	105 b	84.5 b	85.50 b
Line No. 5	17.40 bc	17.30 bc	78 b	77 b	108 b	109 b	109.5 a	111.5 a
Giza 177	18.7 bc	18.9 bc	95 a	95 a	127 a	127 a	111.8 a	112.2 a
$L.S.D._{0.01}$	3.8	4.09	15.3	16.03	17.9	17.11	22.3	21.2

(1) Means followed by the same letter(s) are not significantly different but different letters are significant according to LSD 0.01 level of probability.

This result was similar to the results of Ahadiyat *et al*. (2012), who revealed that the farmers prefer growing short duration rice cultivars than long duration rice cultivars because it's easier and more efficient in crop management and field practice. Early cultivars will save more energy, including water, fertilizer and labor, when they grew in short duration. On the other hand, the new lines No. 1, 2 and Giza 177 cultivar were the significantly latest genotypes in the two seasons 2023 and 2024. Generally, the results indicated that the new rice lines 3, 4 and 5 were significantly earlier in maturity compared to the Giza 177 cultivar. Variation among genotypes for that trait were similar to the results of Liu *et al*.(2024), who found that days to heading ranged from 64 to 148 days, with an average of 95 in all the accessions. Also, variation among lines for that trait were similar to the results of Prasetiyono *et al*.(2019) and Suriyagoda *et al*.(2022).

Regarding plant height (cm), data in Table (3) indicated that plant height was highly significantly different among the rice genotypes in the two seasons. The mean values are presented in Table (4). Data in Table (4) showed that the rice lines No. 1, 2, 5 and Giza 177 cultivar were the significantly tallest in both seasons, respectively. On the other hand, the rice lines No. 3 and 4, were the significantly shortest in both seasons. The differences among the rice genotypes were expected because of their various plant types. Variation among genotypes for that trait were similar to the results of Chamling and Basu (2012), Tayefe *et al*. (2013), Hussain *et al*. (2014), Al-Salim *et al*. (2016) , Sadimantara *et al*. (2017) and Shrestha *et al*. (2021).

3- Milling out-turn characteristics:

The mean squares for hull percentage, in both seasons, are presented in Table (5) while the mean values for this character are shown in Table (6). Data in Table (5) indicated that this quality character was significantly affected by the rice genotypes in the two seasons. This result contradicted that obtained in the brown rice % due to the negative relationship between brown and hull %. Data in Table (6) revealed that, in 2023 and 2024 seasons, line 1, gave the significantly highest hull % than the other rice genotypes. While the results showed that no significant differences were observed among the remaining genotypes for this character. Variation among genotypes for that trait were similar to the results of Subudhi *et al*. (2012), Verma *et al*. (2012), Cruz *et al*. (2021) and Sultana *et al*. (2022).

Regarding brown rice percentage: Analysis of variance for brown rice %, in 2023 and 2024, is presented in Table (5), which indicated that such brown rice % was not significantly affected by the rice genotypes. Data in Table (6) revealed that there were no significant differences among the all genotypes for this character in the two seasons. In general, the medium-grain lines gave higher % of brown rice than the long-grain ones. Variations in this results were similar to those obtained by

Thomas *et al.* (2013), Khatibani *et al.*(2019), Cruz *et al*. (2021) and Sultana *et al*. (2022).

On the other hand, tables 5 and 6 illustrate the mean squares and the mean values for total milled rice percentage (head plus broken rice) under study in 2023 and 2024 seasons. Table (5) reveals that the total milled rice % was not significantly affected by the rice lines in both seasons. In the two seasons, the results in Table (6) shows that the same trend with results for brown rice%, in which there were also no significant among the all genotypes for total milled rice%. Variation among genotypes for that trait were similar to the results of Akram *et al.* (2007), Hussain *et al*. (2014), Subhalakshmi *et al.* (2018), Khatibani *et al.*(2019), Cruz *et al*. (2021), Sinthuja *et al*.(2021), Xia *et al*.(2021) and Gong *et al.* (2023).

4. Chemical composition:

Data in Table (7) shows that the protein content % was significantly affected by the rice genotypes in 2023 and 2024 seasons. Also, the means for such protein content are presented in Table (8). The results showed that the rice line No. 1 gave significantly the highest protein content in the two seasons. On the other hand, in the 2023 and 2024 seasons, the least percentage for this character recorded by the other genotypes, with no significant differences among them. Variations for this traits among genotypes were similar to the results obtained by Asghr *et al.* (2012), Geverk (2012), Thomas *et al.* (2013), Thilange *et al.* (2013), Xia *et al*.(2021), and Sultana *et al*. (2022).

Regarding Amylose content percentage: Analysis of variance for amylose content % was significant effected by the rice genotypes in 2023 and 2024 seasons, as indicated in Table (7). Data in Table (8) showed that the new rice lines No. 1and 2 were the significantly highest values of amylose content% in the two seasons, respectively. As for the results of amylose %, among other genotypes, there were no significant differences detected among them in the two seasons.

The results generally show that the some new rice lines outperform the Giza 177 cultivar in grain quality characters. Variation among genotypes for amylose content were similar to the results of Geverk (2012), Thomas *et al.* (2013), Subhalakshmi *et al.* (2018), Khatibani *et al.*(2019), Cruz *et al*. (2021), Sultana *et al*. (2022) and Gong *et al.* (2023).

Table 5: Analysis of variance for hull (%), brown rice (%) and total milled rice (%) in 2023 and 2024 seasons.

Source of variation	Degrees of freedom	Hull %		Brown rice (%)		Total milled rice (%)	
		2023	2024	2023	2024	2023	2024
BL	2	0.047	0.064	0.075	0.080	0.005	0.02
Genotypes	5	8.003**	8.65**	9.52 ns	9.11 ns	0.85 ns	0.86 ns
Error	10	0.84	0.95	11.2	13.3	12.4	14.4
Total							

**, Significant at 0.01 level.

Table 6: Mean values for hull (%), brown rice (%) and total milled rice (%)in Genotypes of rice in 2023 and 2024 seasons.

Genotypes	Hull (%) [(1)]		Brown rice (%)		Total milled rice (%)	
	2023	2024	2023	2024	2023	2024
Line No. 1	21.70 a	21.90 a	78.30 a	78.10 a	69.35 a	69.52 a
Line No. 2	18.70 b	18.60 b	81.30 a	81.40 a	70.55 a	70.53 a
Line No. 3	18.60 b	18.40 b	81.40 a	81.60 a	69.59 a	69.61 a
Line No. 4	17.60 b	17.50 b	82.40 a	81.50 a	70.04 a	70.16 a
Line No. 5	17.10 b	17.00 b	82.90 a	83.00 a	69.10 a	69.20 a
Giza 177	19.20 b	19.40 b	80.50 a	80.40 a	69.00 a	69.40 a
$L.S.D._{0.01}$	2.37	2.52	N.S.	N.S.	N.S.	N.S

[(1)] Means followed by the same letter are not significantly different but different letters are significant according to LSD 0.01 level of probability.

Table 7: Analysis of variance for protein (%) content and amylose content (%) in 2023 and 2024 seasons.

Source of variation	Degrees of freedom	M.S. protein (%) content		M.S. amylose content (%)	
		2023	2024	2023	2024
BL	2	0.004	0.003	0.01	0.03
Genotypes	5	1.50**	1.75**	10.50**	9.83**
Error	10	0. 15	0.18	1.1	1.28
Total	17				

**, Significant at 0.01 level.

Table 8: Mean values for protein (%) content and amylose content (%)in Genotypes of rice in 2023 and 2024 seasons.

Genotypes	protein (%) content [(1)]		Amylose content (%)	
	2023	2024	2023	2024
Line No. 1	8.30 a	8.50 a	22.80 a	22.20 a
Line No. 2	7.00 b	7.10 b	21.30 a	21.40 a
Line No. 3	7.10 b	7.00 b	18.00 b	18.10 b
Line No. 4	6.90 b	7.00 b	18.20 b	18.10 b
Line No. 5	6.70 b	6.60 b	18.10 b	18.00 b
Giza 177	7.20 b	7.25 b	18.30 b	18.40 b
$L.S.D._{0.01}$	1.002	1.09	2.7	2.92

[(1)] Means followed by the same letter are not significantly different but different letters are significant according to LSD 0.01 level of probability.

CONCLUSION

Evaluating new rice genotypes are essential for developing a crop that can meet the demands of a growing population while tolerating the impact of environmental climate change. By assessing the productivity, disease resistance, and adaptability of new rice genotypes, researcher can identify promising varieties for further development and dissemination to farmers. Based on the present results, it can be recommended that the new lines No. 1 and 5, might be cultivated on a commercial scale due to their high yield and yield components, in addition to, the lines No. 3 , 4 and 5 due to their early maturity. In general, the results of this study showed the superiority of the new rice genotypes in yield and its components, earliness in maturity, as well as grain quality traits compared to the Giza 177 cultivar.

REFERENCES

Ahadiyat, Y.R., Hidayat, P., Mujiono, Tarjoko, & Aguston, T. (**2012**). Harvest time and yield of traditional rice cultivars based on N and P fertilizer management. Research Journal of Pharmaceutical, Biological and Chemical Sciences **3(3):** 662-669.

Akram, M., Rehman, A., Ahmad, M. & Cheema, A.A. (**2007**). Evaluation of rice hybrids for yield and yield components in three different environments. J. Anim. Pl. Sci. **17(3-4).**

Al-Salim, S.H.F., Al-Edelbi, R., Aljbory,F. & Mohamed, S. M. M.(**2016**). Evaluation of the performance of some rice (Oryza sativa L.) varieties in two different environments.Vol.3, No.**1**. Article ID:68189, 10.4236/oalib.1102294.

Anders, S., Cowling, W., Pareek, A., Gupta, K. J., Singla-Pareek, S. L. & Foyer, C. H. (**2021**). Gaining acceptance of novel plant breeding technologies. Trends Plant Sci. 26: 575-587.

Asghr, S., Anjum, F.M., Amir, R.M. & Asifkhan, M.(**2012**). Cooking and eating characteristics of rice (oryza sativa, L.). Pakistan J. Food Sci., **22(3):** 128- 132.

Atera, E.A., Onyancha, F.N. & Majiwa, E.B.O. (**2018**). Production and marketing of rice in Kenya: challenges and opportunities. Journal of Development and Aricultural Economics, Vol. **10**, No. 3: 64-70.

Chamling, N. & Basu, A.K. (**2012**). Evaluation of hybrid rice varieties in west Bengal condition. International Journal of Science and Research, India. DOI: https://doi.org/10.3126/janr.v4i2.33967.

Cruz, M., Arbelaez, J.D., Loaiza, K., Cuasquer, J., Rosas, J. & Graterol, E.(**2021**). Genetic and phenotypic characterization of rice grain quality traits to define research strategies for improving rice milling, appearance, and cooking qualities in Latin America and the Caribbean. https://doi.org/10.1002/tpg2.20134.

Gawdiya, S., Kumar, D., Mehrotra, S., Chandra, M.,S., Kumawat, A., Kumar, R., Price, A.,H., Raghuram, N., Pathak, H. & Sutton, M. A. (**2023**). Field-Based Evaluation of Rice Genotypes for Enhanced Growth, Yield Attributes, Yield and Grain Yield Efficiency Index in Irrigated Lowlands of the Indo-Gangetic Plains. Vol. ***15*****(11):** 87-93. Doi.org/10.3390/su15118793.

Gevrek, M. N. (**2012**). Some Agronomic and quality characteristics of new rice varieties in the Aegen region of Turkey. Turkish Journal of Field Crops, **17(1)**: 74-77.

Gong, D., Zhang, X., He, F., Chen, Y., Yao, J., Zhang, M., Wenjing, & Guangxing, Y. (**2023**). Genetic Improvements in Rice Grain Quality: A Review of Elite Genes and Their Applications in Molecular Breeding. Agronomy Journal. **2023**, ***13*****(5),** https://doi.org/10.3390/agronomy13051375.

Hussain, S., Fujii, T., McGoey, S., Yamada, M., Ramzan, M. & Akmal, M .(**2014**). Evaluation of different rice verities for growth and yield characteristics. The Journal of Animal & Plant Sciences, **24(5):** 1504-1510.

Khatibani, L.B., Fakheri, B.A., Chaleshtori, M.H., Mahender, A., Nafiseh, M. & Ali, J.(**2019**). Genetic Mapping and Validation of Quantitative Trait Loci (QTL) for the Grain Appearance and Quality Traits in Rice (Oryza sativa L.) by Using Recombinant Inbred Line (RIL) Population. International journal of Genomics. https://doi.org/10.1155/2019/3160275.

Kubo, Masayoshi, Purevdorj & Minjmaa. (2004) The future of rice production and consumption. Journal of Food Distribution Research. Vol. 35,1: 128 -142.

Liu, J., Yi, Q., Dong, G., Chen, Y., Guo, L., Gao, Z., Zhu, L., Ren, D., Zhang, Q., Li, Q., Li, J., Liu, Q., Zhang, G., Qian, Q., & Shen, L. (**2024**). Improving Rice Quality by Regulating the Heading Dates of Rice Varieties without Yield Penalties. J. *Plants* **2024,** ***13*****(16), 2221**; https://doi.org/10.3390/plants13162221.

Patel, D.P., Das, G.C., Munda, P.K., Ghosh, Bordeloi & Kumar, M. (**2012**). Evaluation of yield and physiological attributes of high-yielding rice varieties under aerobic and Flood-irrigated management practices in mid-hills ecosystem. Agricultural Water Mangment, India.**97**: 1269- 1276.

Pramudyawardani, E.F., Suprihatno, B., & Mejaya, M.J. (**2015**). Potensi Hasil Galur Harapan Padi Sawah Ultra Genjah dan Sangat Genjah. Penelitian Pertanian Tanaman Pangan, **34(1):** 1-11.

Prasetiyono, Fatimah, J., Dadang, A. & Masumah, T(**2019**). Field evaluation of coned progenies with early heading date and resistance to bacterial leaf blight. Annales Bogorienses. Vol. **23**, No. **2**: 87-96.

Prasetiyono, Fatimah, J., Dadang, A. & Tasliah. (**2014**). Improvement of early maturity in rice variety by marker assisted backcross breeding of Hd2 gene. Indonesian Journal of Agricultural Science, **15(2):**55-64.

Sadimantara, G. R., Nuraida,W., Suliartini, N. W. S. & Muhidin. (**2017**). Evaluation of some new plant type of upland rice (Oryza sativa L.) lines derived from cross breeding for the growth and yield characteristics. 1st International Conference on Food Security and Sustainable Agriculture in The Tropics (IC-FSSAT) 24–25 **October 2017,** Sulawesi Selatan, Indonesia. DOI 10.1088/1755-1315/157/1/012048.

Shrestha, J., Subedi, S., Kumar, U., Kushwaha, S. & Maharjan, B. (**2021**). Evaluation of rice genotypes for growth, yield and yield components. Journal of Agriculture and Natural. Vol.**4**, No.**2.** DOI: http://dx.doi.org/10.14203/ann.bogor.

Sinthuja, R., Prasantha, B.D. R. & Hettiarachchi, A. (**2021**). Comparative study of grain quality characteristics of some selected traditional and improved rice varieties in Sri Lanka. Sri Lanka Journal of Food and Agriculture, **7(1):** 13-30. DOI: http://doi.org/10.4038/sljfa.v7i1.91.

Subhalakshmi, S., Devi, G. A., Singh, S. & Brajakishore, Ch. (**2018**). Grain quality evaluation of some aromatic rice varieties of Manipur, India. Indian Journal. Vol. **19, 2:** 169-181.

Subudhi, H.N., Swain, D., Das, S., Sharma, S.G. & Singh, O.N. (**2012**). Studies on grain yield, physic-chemical and cooking characters of Elite rice varieties in Eastern India. Journal of Agricultural Science; Vol.**4**, No. **12**, India. :269-275.

Sultana, S., Faruque, M. & Islam, M. R. (**2022**). Rice grain quality parameters and determination tools a review on the current developments and future prospects. International Journal of Food Properties. Vol. **25**. Doi.org/10.1080/10942912.207129.

Suriyagoda, L., Illangakoon, T., Wijerathna, S. S.G. & Devasinghe, U. (**2022**). Degree-day requirement for heading and maturity of three most popular rice varieties in Sri Lanka as influenced by location and season. Sri Lanka Journal of Food and Agriculture. Vol. **51, 3**: 229-245. DOI: 10.4038/cjs.v51i3.8031.

Tarang, A., Chaleshtary, M. H. , Tolghilani, A. & Esfahani, M. (**2013**). Evaluation of grain yield stability of pure lines of rice in Guilan province. Iranian Journal of Crop Sciences, Vol. **15**, No. **1**, 24- 34.

Tayefe, M., Zade, A., Amiri, E. & Zade, A.N. (**2013**). Effect of nitrogen on rice yield, yield components and quality parameters. African Journal of Biotechnology, Vol. **13(1)**: 91-105.

Thilang, N., Xa, T., Thiluy, T. & Chibuu, B. (**2013**). Rice breeding for grain quality in the Mekong Delta Oman rice. Vietnam, **19**: 54- 60.

Thomas, R., Nadiah, W.A. and Bhat, R. (**2013**). Physiochemical properties. Proximate composition and cooking qualities of locally grown and imported rice varieties marketed in penang, Malaysia. International Food Research Journal, **20(3)**: 1345-1351.

Verma, D.K., Mohan, M., Yadav, V. K., Asthir, B. & Soni, S. S. (**2012**). Inquisitor of some physic-chemical characteristics of newly evolved Basmatic rice. Environment Ecology, **30(1)**: 114- 117, India.

Xia,Y., Sun, Y., Yuan, J. & Xing, C. (**2021**). Grain quality evaluation of japonica rice effected by cultivars, environment, and their interactions based on appearance and processing characteristics. Food science and nutrition. https://doi.org/10.1002/fsn3.2181.

Xue, W., Xing, Y., Weng, X., Zhao, Y., Tang, W., Wang, L., Zhou, H., Yu, S., Xu, C. & Li, X. (**2008**). Natural variation in Ghd7 is an important regulator of heading date and yield potential in rice. Nat. Genet. **40**, 761–767.

Zhang, Y., Tang, Q., Zou, Y., Zou, D., Li, J., Qin, S., yang, L., Chen, B., Xia & Peng, S. (**2009**). Yield potential and radiation use efficiency of "Super" hybrid rice grown under subtropical conditions. Field Crops Research, **114**: 91- 98.

الملخص العربي

تقييم بعض التراكيب الوراثية الجديدة من الأرز لصفات المحصول وجودة الحبوب بالمقارنة مع الصنف جيزة ١٧٧

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أجريت تجربتان حقليتان في محطة تجارب البحوث الزراعية بكلية الزراعة جامعة الإسكندرية خلال موسمي صيف عامي ٢٠٢٣ و٢٠٢٤. وكان الهدف الرئيسي من هذه الدراسة هو تقييم خمس سلالات جديدة من الارز، وهي السلالة رقم ١، ٢، ٣، ٤ والسلالة رقم ٥ بالإضافة إلي الصنف جيزة ١٧٧ وتم إستخدامه كصنف مقارنة، والتي إختلفت في الشكل المورفولوجي للنبات وفترة النضج والإنتاجية وجودة الحبوب. وقد تم إستخدام تصميم القطاعات كاملة العشوائية، في ثلاث مكررات، في كلا الموسمين. عموما تفوقت بعض السلالات الجديدة علي صنف المقارنة في صفات المحصول ومكوناته وجودة الحبوب وكذلك في صفة التبكير في النضج، وأشارت النتائج إلى أن السلالة رقم ١ أعطت أعلى معنوية في صفات: محصول الحبوب، بمتوسط (١٠.٨٠ و١٠.٧٤ طن/هكتار)، وعدد الخلفات فرع الحاملة للسنابل/م٢، (٤٤٧ و٤٤٢ خلفة)، وعدد حبوب في السنبلة، (٢٣٠ و٢١٦ حبة)، وطول السنبلة (٢٦.٥٠ و٢٦.٣٠ سم)، ومحتوى البروتين ومحتوى الأميلوز %، في الموسمين على التوالي. من ناحية أخرى، سجلت السلالة رقم ٥ أعلى معنوية في إنتاجية محصول الحبوب(١٠.٧٠ و١٠.٦٠ طن/هكتار)، وعدد الخلفات الحاملة للسنابل /م٢ (٤٧٥ و٤٦٩ خلفة)، ووزن ١٠٠ حبة (٣.٩٣ و٣.٩٥ جم)، في الموسمين على التوالي. كما تشير النتائج إلى عدم وجود فروق معنوية بين السلالات رقم ٣ ،٤ و٥ في مدة النضج، وأنها كانت الأبكر معنوياً. وفي موسمي ٢٠٢٣ و٢٠٢٤، أشارت النتائج ان السلالة رقم ٢، قد سجلت زيادة غير معنوية في نسبة تصافي التبييض.