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Performance of Some Rice Genotypes to Various Nitrogen Levels

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ABSTRACT

The present investigation was carried out at the Experimental Farm of Sakha Agricultural Research Station, Sakha, Kafr El-Sheikh, Egypt during 2015 and 2016 seasons to study the behavior of some rice genotypes under nitrogen application. Twelve rice genotypes Sakha 105, Sakha 106, Giza 179, G9461-4-2-3-1, GZ 9626-2-1-3-2-3,GZ9807-6-3-2-1,GZ9399-4-1-1-3-2-2, GZ9399-4-1-1-2-1-, GZ10101-5-1-1-1, GZ10147-1-2-1-1,GZ10154-3-1-1-1and PL-GE-101-SP-26 were tested under three different nitrogen levels i.e., 60, 120 and 180 kg N ha^{-1}. The experimental design was split plot with four replications. Yield and yield components were determined in both seasons. The main results on the current attempt could be summed up as follows; The tested rice genotypes had great variation in their yield and yield components in both study seasons. PL-GE-101-SP-26 had the tallest plants, while the shortest plant was Sakha 105 rice variety. GZ 9461-4-2-3-1 gave the longest panicle, number of tillers, and number of panicles, number filled grains $panicle^{-1}$, grain and straw yields. Giza 179 and GZ9461 were comparable regarding grain yield. GZ10147 had the longest period from sowing to heading. All measured parameters were affected by different nitrogen levels in both seasons, whereas, the highest values of different parameters were recorded with higher nitrogen rate of 180 kg ha^{-1}. The interaction between rice genotypes and nitrogen levels had significant effect on plant height, tillers number, days to heading, panicle numbers $hill^{-1}$, panicle length, filled grains $panicle^{-1}$, 1000 –grain weight and grain yield in both seasons. It could be concluded that, all tested rice genotyped significantly responded to nitrogen application up to 180 kg N ha^{-1}

Keywords: Rice, nitrogen, physio-morphological traits.

INTRODUCTION

Rice (*Oryza sativa* L.) is considered main second food crops after wheat but is the first in east fear eat Asian countries. It is cultivatedin a wide range of environments including large area. Rice is staple diet of world the population in Asia, Latin America, and Africa as well.

Nitrogen fertilizer is one of the most important key of agronomic inputs and restricting factors developing thefullness potentialof rice grain yield globally. Use an adequate nitrogen rate is important not only for obtaining maximum economic return, but also to reduce environmental pollution. Excessive nitrogen application can result in accumulation of large amounts of post-harvest residual soil N.

(Fageria and Baligar, 2003) referred that remain nitrogen after main crop could be used in next crop but the nitrogen losing by leaching during non-crop period in rainy countries is obstacle.

Elevating efficient use of nitrogen as chemical fertilizers is much need, not only through cultivation techniques, but also by releasing new elite rice varieties, which are characterized with high nitrogen use efficiency to reduce nitrogen inputs from farming to the environment (Fageria *et al.*, 2008 and Sachiko *et al.*, 2009). El-Refaee (2007), Zayed *et al.* (2007), Abdallah *et al.* (2013) and Zayed *et al.* (2014) reported marked variation in performance of rice genotypes under different conditions.

Increasing nitrogen rate pronounced raised the main yield components of rice; panicle numbers $plant^{-1}$, grains panicle $^{-1}$, panicle weight, 1000 -grain weight ,grain and straw yields and harvest index [Meena *et al.* (2003), Shivay and Singh (2003), Gautam (2004), Zayed *et al.*(2005), Zayed *et al.*(2006),Hasanuzzaman *et al.*(2012) and Ritesh *et al.*(2014)] .Also, Manzoor *et al.*(2006) reported that rice varieties differed in their response to nitrogen even the yield components since the optimum nitrogen rate was 175 kg N /ha^{-1} for rice grain yield but as 225 kg N $ha^{-1}$for plant height, tiller numbers, panicle number and panicle weight.

Zayed *et al.*(2006) and Metwally *et al.* (2014) reported clear variation in rice genotypes response for nitrogen fertilizer rates.

The objective of this study was to determine the genotypes which give high yield under low nitrogen application.

MATERIALS AND METHODS

The present investigation was carried out at the Farm of Sakha Agricultural Research Station, Sakha, Kafr El-Sheikh, Egypt, during 2015and 2016 seasons to compare the behavior of twelve rice genotypes; Sakha 105, Sakha 106, Giza 179, GZ 9461-4-2-3-1,GZ 9626-2-1-3-2-3, GZ 9807-6-3-2-1,GZ 9399-4-1-1-3-2-2,GZ 9399-4-1-1-2-1,GZ10101-5-1-1-1,GZ10147-1-2-1-1,GZ 10154-3-1-1-1and PL-GE-101-SP-26 under three nitrogen levels viz; 60, 120 and 180 kg N ha^{-1}.Some physical and chemical properties of the experimental sites are listed in Table 1.

Table 1. Some physical and chemical properties of the experimental sites in 2015 and 2016 seasons.

Seasons Soil properties	2015	2016
Clay %	56.1	55.4
Silt %	31.3	33.36
Sand %	12.6	12.27
Texture	clay	clay
Organic matter %	1.4	1.5
Total nitrogen, g/kg(ppm)	450	560
pH (1:2.5 soil suspension)	7.9	8
available N mg L^{-1}	25	24
available K mg L^{-1}	320	319

Nitrogen fertilizer was supplied in the form of urea (46.5% N) in two equal splits, i.e., half as basal incorporated into the dry soil immediately before flooding followed by the second dose at 30 days after transplanting. Pre-germinated seeds were uniformly broadcasted in the nursery on 5^{th} May of the two seasons. Twenty five days old seedlings of each genotype were transplanted at 20 X 20 cm spacing with two seedlings hill^{-1}. Plot size was 12 m^2. All other agronomic practices were followed as recommended during the growing seasons.

The experiment was laid out in strip plot design with four replications, where varieties were represented in the horizontal plots, while nitrogen levels were distributed in the vertical plots. Prior to harvest rice traits were recorded viz: plant height (cm),number of tillers hill^{-1}, number of panicle hill^{-1}, number of filled grains panicle^{-1}, panicle weight (g),number of panicles hill^{-1}, 1000-grain weight (g), grain yield t/ha (grains adjusted to 14% moisture content). All data collected were subjected to standard statistical analysis of variance following the methods described by Gomez and Gomez (1984) using the computer program (IRRISTAT). The treatment means were compared using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Data in Table2 showed that significant differences for plant height, number of tillers and days to heading were recorded with various nitrogen levels in both seasons. The highest values of above-mentioned traits were obtained by higher nitrogen level of 180 kg N ha^{-1}. On contrast, the minimum means of those traits were produced by the lower nitrogen level of 60 kg N ha^{-1}. Maximum days to heading was observed in the plots fertilized with 180 kg N ha^{-1}, while minimum days was observed in the plots fertilized with 60 kg N ha^{-1}. Application of nitrogen increase vegetative growth at early growth stage and make the plant luxuriant, this in turn gets more days to heading. Days to heading differed significantly among rice genotypes and varied from 119 and 128 days in rice genotype. Applying N might be increased the nitrogen availability resulted in more N uptake and concentration lead to enhancing rice growth and dry matter production. Shivay and Singh(2003), Gautam(2004), Zayed *et al.* (2005), Zayed *et al.*(2006), Hasanuzzaman *et al.* (2012) and Ritesh *et al.* (2014) came to similar findings.

All rice genotypes were significantly varied in their response to nitrogen fertilizer. The tallest plants (cm) was found with PL-GE-101-SP-26 and the shortest plants were found with GZ10147-1-2-1-1.Giza 179 and GZ 9461-4-2-3-1 gave the highest value of number of tillers hill^{-1} in the two season of study. The GZ 10147-1-2-1-1 had the longest period from sowing to heading date, while Giza 179 recorded the shortest period from sowing to heading date in both study seasons (Table2). The variations among tested rice genotypes are mainly due to the variance in their genetic makeup. There are closed similarity with those repoted byEl-Refaee (2007), Zayed *et al.* (2007) and Abdallah *et al.*(2013).

Table 2. Plant height, number of tillers and days to heading of rice genotypes as affected by nitrogen levels in 2015 and 2016 seasons.

Characters / Treatments	Plant height(cm)		Number of tillers hill^{-1}		Days to heading(day)	
Kg N ha^{-1}	2015	2016	2015	2016	2015	2016
60	98.5c	96.5c	21.55c	20.55c	123.0c	124.03c
120	100.9b	98.9b	23.75b	22.75b	124.0b	125.03b
180	103.2a	101.2a	24.55a	23.55a	124.7a	125.75a
F test	**	**	**	**	**	**
Rice genotype						
Sakha 105	98.2g	96.2g	23.35c	22.35c	123.7d	124.73d
Sakha 106	105.1b	103.1b	21.25e	20.25e	126.0b	127.03b
Giza 179	99.9ef	97.9ef	25.85a	24.85a	123.5d	124.53d
GZ 9461-4-2-3-1	98.4g	96.4g	25.55a	24.55a	125.0c	126.03c
GZ 9626-2-1-3-2-3	102.8c	100.8c	22.25d	21.25d	125.6b	126.63b
GZ 9807-6-3-2-1	100.4e	98.4e	22.25d	21.25d	123.3d	124.33d
GZ 9399-4-1-1-3-2-2	100.2e	98.2e	23.35c	22.35c	121.6e	122.63e
GZ 9399-4-1-1-2-1-2	101.8cd	99.8cd	24.15b	23.15b	122.0e	123.03e
GZ10101-5-1-1-1	98.7fg	96.7fg	23.55bc	22.55bc	125.7b	126.73b
GZ 10147-1-2-1-1	96.8h	94.8h	22.95c	21.95c	127.1a	128.13a
GZ 10154-3-1-1-1	100.6de	98.6de	23.45c	22.45c	124.5c	125.53c
PL-GE-101-SP-26	107.5a	105.5a	21.55e	20.55e	119.1f	120.13f
Interaction N x G	**	**	**	**	**	**

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

The interaction between rice genotypes and nitrogen levels were significant in the two seasons regarding plant height, number of tillers hill^{-1} and days to heading (Tables 3, 4 and 5).Data in Table 3 showed that rice genotypes significantly differed in their response to nitrogen fertilizer. The tallest plants were observed when rice plants were received higher nitrogen level of 180 kg N ha^{-1} with rice genotype of PL-GE-101-SP-26 in the two study seasons. There are insignificant difference between GZ 9626-2-1-3-2-3and PL-GE-101-SP-26, while the shortest plants were observed when rate of 60 kg N ha^{-1} was applied with rice genotype GZ 10147-1-2-1-1. This means that the nitrogen is major factor effect in plant height, and rice genotypes deferent respond to nitrogen fertilizer in the two seasons under studied. These results were in a good agreement with those reported by Zayed *et al.* (2006) and Metwally *et al.* (2014).

In the two seasons of study, nitrogen doses had a significant effect on number of tillers hill^{-1} (Table 4).

Maximum number of tillers hill^{-1} was observed in the plots fertilized with 180 kg N ha^{-1} followed by 60 and 120 kg N ha^{-1}, while minimum number of tillers hill^{-1} was observed in the plots fertilized with 60 kg N ha^{-1}. (Zayed *et al*., 2006).

Table 3. Plant height (cm) as affected by the interaction between rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1} 60	120	180	2016 Kg N ha^{-1} 60	120	180
Sakha 105	100.0ijk	98.3klm	96.4m-p	98.00ijk	96.3klm	94.4m-p
Sakha 106	96.4def	105.1cde	106.3bc	94.4def	103.1cde	104.3bc
Giza 179	95.0opq	99.80ijk	105.0cde	93.0opq	97.8ijk	103.0cde
GZ 9461-4-2-3-1	95.3n-q	98.60j-m	101.3ghi	93.3n-q	96.6j-m	99.3ghi
GZ 9626-2-1-3-2-3	97.0l-o	102.9e-h	108.7a	95.0l-o	100.9e-h	106.7a
GZ 9807-6-3-2-1	100.0ijk	100.5ijk	100.7g-j	98.0ijk	98.5ijk	98.7g-j
GZ 9399-4-1-1-3-2-2	94.3pq	100.3ijk	106.0bcd	92.3pq	98.3ijk	104.0bcd
GZ 9399-4-1-1-2-1-2	100.6hij	101.8f-i	103.0efg	98.6hij	99.8f-i	101.0efg
GZ10101-5-1-1-1	96.0n-q	98.80jkl	101.4ghi	94.0n-q	96.8jkl	99.4ghi
GZ 10147-1-2-1-1	94.0q	96.90l-o	99.60ijk	92.0q	94.9l-o	97.6ijk
GZ 10154-3-1-1-1	97.3lmn	100.5ijk	103.9def	95.3lmn	98.5ijk	101.9def
PL-GE-101-SP-26	106.0b	107.5ab	109.0a	104.0b	105.5a	107.0a

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

Table 4. Number of tillers hill^{-1}as affected by the interaction between rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1} 60	120	180	2016 Kg N ha^{-1} 60	120	180
Sakha 105	22.50nop	23.85g-l	24.25f-i	21.0nop	22.8g-l	23.2f-i
Sakha 106	16.35s	21.75nop	25.75bcd	15.3s	20.7nop	24.7bcd
Giza 179	24.50g-j	26.35ab	27.25a	23.0g-j	25.3ab	26.2a
GZ 9461-4-2-3-1	25.65bcd	26.05abc	25.05c-g	24.6bcd	25.0abc	24.0c-g
GZ 9626-2-1-3-2-3	19.65r	22.75k-o	24.45e-i	18.6r	21.7k-o	23.4e-i
GZ 9807-6-3-2-1	21.35p	22.75l-o	22.65mno	20.3p	21.7l-o	21.6mno
GZ 9399-4-1-1-3-2-2	23.35i-m	23.85g-l	22.95j-n	22.3i-m	22.8g-l	21.9j-n
GZ 9399-4-1-1-2-1-2	24.35e-i	24.65d-h	23.45i-m	23.3e-i	23.6d-h	22.4i-m
GZ10101-5-1-1-1	21.65op	24.05g-j	24.95c-g	20.6op	23.0g-j	23.9c-g
GZ 10147-1-2-1-1	20.05qr	23.45i-m	25.45b-e	19.0qr	22.4i-m	24.4b-e
GZ 10154-3-1-1-1	21.05pq	23.95g-k	25.35b-f	20.0pq	22.9g-k	24.3b-f
PL-GE-101-SP-26	19.05r	22.05nop	23.55h-m	18.0r	21.0nop	22.5h-m

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

Nitrogen doses had a significant effect on days to heading (Table 5). Maximum days to heading was observed in the plots fertilized with 180 kg N ha^{-1} followed by 120 kg N ha^{-1}, while minimum days was observed in the plots fertilized with 60 kg N ha^{-1}. Since application of nitrogen increases vegetative growth and make the plant luxuriant, this in turn gets more days to heading delayed heading by fluorine hormone exertion (Zayed *et al*., 2006).

Table 5. Days to heading as affected by the interaction between rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1} 60	120	180	2016 Kg N ha^{-1} 60	120	180
Sakha 105	122.0mno	124.0h-k	125.3d-g	123.0mno	125.0h-k	126.3d-g
Sakha 106	125.6def	126.0cde	126.3cd	126.6def	127.0cde	127.3cd
Giza 179	124.6f-i	123.6ijk	122.3lmn	125.6f-i	124.6ijk	123.3lmn
GZ 9461-4-2-3-1	125.6def	125.0e-h	124.3g-j	126.6def	126.0e-h	125.3g-j
GZ 9626-2-1-3-2-3	123.3jkl	126.0cde	127.6b	124.3jkl	127.0cde	128.6b
GZ 9807-6-3-2-1	123.0klm	123.3jkl	123.6ijk	124.0klm	124.3jkl	124.6ijk
GZ 9399-4-1-1-3-2-2	121.0o	121.6no	122.3lmn	122.0o	122.6no	123.3lmn
GZ 9399-4-1-1-2-1-2	121.6no	122.3lmn	122.0mno	122.6no	124.3lmn	123.0mno
GZ10101-5-1-1-1	125.6def	126.0cde	125.6def	126.6def	127.0cde	126.6def
GZ 10147-1-2-1-1	124.3g-j	127.0bc	130.0a	125.3g-j	128.0bc	131.0a
GZ 10154-3-1-1-1	123.6ijk	124.6f-i	125.3d-g	124.6ijk	125.6f-i	126.3d-g
PL-GE-101-SP-26	116.0q	119.3p	122.0mno	117.0q	120.3p	123.0mno

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

A significant positive effect on the number of panicles hill^{-1}, panicle length (cm) and number of filled grains panicle^{-1} of the rice genotype was observed from the various N application fertilizers (Table 6). The application of nitrogen fertilizer up to 180 kg N ha^{-1} significantly increased number of panicles hill^{-1}, panicle length (cm) and number of filled grains panicle^{-1} in both seasons ofstudy. The effect of nitrogen application on number of panicles hill^{-1} attributed mainly to the stimulation effect of nitrogen on effective tillers formation. The increasing nitrogen fertilizer might be increased the auxin exertion which increased the cell elongation and division producing long panicle.

Table 6. Number of panicles , panicle length and number of filled grains of rice genotypes as affected by nitrogen levels in 2015 and 2016 seasons.

characters / treatments	No. of paniclehill^{-1}		Panicle length(cm)		No. filled grains panicles^{-1}	
Kg N ha^{-1}	2015	2016	2015	2016	2015	2016
60	19.2c	18.2c	23.0c	21.4c	148.0c	146.0c
120	21.4b	20.4b	24.1b	22.5b	153.2b	151.1b
180	22.2a	21.2a	24.5a	22.9a	162.4a	160.3a
F test	**	**	**	**	**	**
Rice genotypes						
Sakha 105	21.0c	20.0c	24.4ab	23.4ab	147.2f	145.1f
Sakha 106	18.9e	17.9e	24.1ab	23.1ab	140.8g	138.6g
Giza 179	23.5a	22.5a	24.0bc	23.0bc	173 .0 a	170 .8 a
GZ 9461-4-2-3-1	23.2a	22.2a	25.0a	24.0a	167.4b	165.2b
GZ 9626-2-1-3-2-3	19.9d	18.9d	22.8d	21.8d	161.8c	159.7c
GZ 9807-6-3-2-1	19.9d	18.9d	23.0d	22.0d	157.4d	155.3d
GZ 9399-4-1-1-3-2-2	21.0c	20.0c	24.7ab	23.7ab	167.7b	165.5b
GZ 9399-4-1-1-2-1-2	21.0c	20.0c	24.5ab	23.5ab	162.7c	160.6c
GZ10101-5-1-1-1	21.2bc	20.2bc	24.5ab	23.5ab	145.5f	143.3f
GZ 10147-1-2-1-1	20.6c	19.6c	22.4d	21.4d	153.3e	151.1e
GZ 10154-3-1-1-1	21.0c	20.0c	23.1cd	23.1cd	136.2h	134.0h
PL-GE-101-SP-26	19.1e	18.1e	24.1 b	23.1 b	141.4g	139.2g
Interaction N x G	**	**	**	**	**	**

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

The interaction between nitrogen levels and rice genotypes was significant regarding number of panicle hill^{-1},panicle length (cm) and number of filled grains panicle^{-1} (Table 7,8 and 9) in both seasons of study.

Data in Table 7 showed that the highest values of number of panicle hill^{-1} were found when the nitrogen level of 180 kg N ha^{-1} was added with Giza 179, while the lowest values of number of panicle^{-1}when application of 60 kg N ha^{-1}was added with sakha 106 in the two seasons under studied. Panicle length (cm) was increased when increased nitrogen application with all rice genotype under study (Table 8).On the other hand the tallest panicle were observed when application of 120 kg N ha^{-}1 and 180 kg N ha^{-1}was applied with GZ9461-4-2-3-1 and GZ10154-3-1-1-1 while the shortest panicles were observed when application of 60 kg N ha^{-1}was added with GZ10147-1-2-1-1 in the two seasons under studied.

Table 7. Number of panicles hill^{-1}as affected by the interaction between ricegenotypes and different nitrogen levels in 2015 and 2016 seasons.

N-levels / Rice genotypes	2015 Kg N ha^{-1} 60	120	180	2016 Kg N ha^{-1} 60	120	180
Sakha 105	19.6f-i	21.54g-l	21.91	17.6f-i	20.54g-l	20.91
Sakha 106	14.0s	19.4nop	23.4bcd	13.0s	18.4nop	22.4bcd
Giza 179	21.6g-j	24.0ab	24.9a	20.6g-j	23.0ab	23.9a
GZ 9461-4-2-3-1	23.3bcd	23.7abc	22.6c-g	22.3bcd	22.7abc	21.6c-g
GZ 9626-2-1-3-2-3	17.3r	20.4	22.0e-i	16.3r	19.4	21.0e-i
GZ 9807-6-3-2-1	19.0p	20.4l-o	20.31-o	18.0p	19.4l-o	19.31-o
GZ 9399-4-1-1-3-2-2	21.0i-m	21.5g-l	20.5j-n	20.0i-m	20.5g-l	19.5j-n
GZ 9399-4-1-1-2-1-2	22.0e-i	22.3d-h	21.1i-m	21.0e-i	21.3d-h	20.1i-m
GZ10101-5-1-1-1	19.3op	21.7g-j	22.6c-g	18.3op	20.7g-j	21.6c-g
GZ 10147-1-2-1-1	17.6qr	21.1i-m	23.1b-e	16.6qr	20.1i-m	22.1b-e
GZ 10154-3-1-1-1	18.6pq	21.5g-k	23.0b-f	17.6pq	20.5g-k	22.0b-f
PL-GE-101-SP-26	16.6r	19.6nop	21.2h-m	15.6r	18.6nop	20.2h-m

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

Data in Table 8 showed that the tallest panicles were obtained when the nitrogen rate of 180 kg N ha^{-1}was applied, while the shortest panicles were obtained when applied 60 kg N ha^{-1}.The significant increase in panicle length by increasing nitrogen level up to 120 kg N ha^{-1}it could be concluded that nitrogen fertilization resulted in an increase in the amount of metabolites synthesized by rice plant and this, in turn, might account much for the superiority of number of filled grains panicle^{-1}. These results were true in both seasons and are in good agreement with Shivay and Singh. (2003), Gautam. (2004) , Zayed *et al.*(2005b), Zayed *et al.* (2006), Hasanuzzaman *et al.* (2012) and Ritesh *et al.* (2014).

Data in Table 9 showed that plants treated with 180 kg N ha $^{-1}$ gave the highest number of filled grains panicle^{-1} compared with plants treated with 60 kg N ha^{-1} in the two seasons under study. Data showed also that the highest number of filled grains panicle were found with GZ 10147-1-2-1-1 and GZ 9807-6-3-2-1, while the lowest number of filled grains panicle were found with GZ 10154-3-1-1-1 under application of 60 kg Nha^{-1}. Similar findings had been reported by Zayed *et al.* (2006) and Metwally *et al.* (2014).

Table 8. Panicle length (cm)as affected by the interaction between rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1} 60	120	180	2016 Kg N ha^{-1} 60	120	180
Sakha 105	22.9g-k	24.1b-e	24.4a-d	21.6g-k	22.9b-e	23.2a-d
Sakha 106	22.6i-l	23.7c-g	24.3a-e	21.3i-l	22.4c-g	23.3a-e
Giza 179	22.4kl	23.6d-h	24.1b-e	21.1kl	22.4d-h	22.9b-e
GZ 9461-4-2-3-1	23.5d-i	24.6abc	25.1a	22.2d-i	23.3abc	23.9a
GZ 9626-2-1-3-2-3	20.7e-j	22.5jkl	23.4e-j	19.4e-j	21.2jkl	22.1e-j
GZ 9807-6-3-2-1	23.0f-k	22.4kl	21.8l	22.0f-k	21.1kl	20.5l
GZ 9399-4-1-1-3-2-2	24.4a-d	23.9b-e	23.8c-g	23.1a-d	22.6b-e	22.5c-g
GZ 9399-4-1-1-2-1-2	24.0b-e	23.9b-f	23.8-g	22.70b-e	22.7b-f	22.5-g
GZ10101-5-1-1-1	22.7h-l	24.2a-e	24.8ab	21.5h-l	23.2a-e	23.4ab
GZ 10147-1-2-1-1	19.1n	22.3kl	23.8b-g	17.7n	21.0kl	22.5b-g
GZ 10154-3-1-1-1	20.4m	23.0f-k	24.2a-e	19.4m	21.7f-k	22.8a-e
PL-GE-101-SP-26	23.5d-i	23.5d-i	23.4ef-j	22.3d-i	22.2d-i	22.1ef-j

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

Table 9. Number of filled grains panicle^{-1}as affected by the interaction between rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1} 60	120	180	2016 Kg N ha^{-1} 60	120	180
Sakha 105	138.6mn	145.6k	157.3hi	136.2mn	143.4k	155.1hi
Sakha 106	136no	139.6lm	147.0k	133.8no	137.4lm	145.0k
Giza 179	181.3b	175.0cd	162.6fg	179.0b	173.1cd	160.4fg
GZ 9461-4-2-3-1	160.3gh	166.3e	175.6c	158.2gh	164.2e	173.5c
GZ 9626-2-1-3-2-3	164.3ef	164.6ef	156.6i	162.1ef	162.4ef	154.5i
GZ 9807-6-3-2-1	137.3mno	152.0j	183.0ab	135.3mno	150.1j	181.0ab
GZ 9399-4-1-1-3-2-2	165.3ef	165.6ef	172.1d	163.2ef	163.5ef	170.1d
GZ 9399-4-1-1-2-1-2	174.0cd	166.6e	147.66k	172.0cd	164.4e	145.5k
GZ10101-5-1-1-1	135.0o	142.3l	159.3hi	133.0o	140.2l	157.2hi
GZ 10147-1-2-1-1	128.0p	147.3k	184.66a	126.0p	145.2k	182.5a
GZ 10154-3-1-1-1	127.0p	135.3o	146.3k	125.0p	133.1o	144.2k
PL-GE-101-SP-26	128.6p	138.6mn	157i	126.4p	136.4mn	155.2i

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

AS for 1000-grain weight (g), Table 10 revealed that application of nitrogen significantly increased the 1000-grain weight (g). Thus, the highest values of 1000-grain weight appeared when nitrogen was applied at the rate of 180 kg N ha^{-1}. This is mainly due to the higher number of spikelets per panicle in plants received nitrogen and heavy grain. Apparent improvement in the sink capacity and the source relation was due to nitrogen application therefore, the filling of grains was optimum.

Grain yield was significantly varied among nitrogen levels and genotypes (Table10). The application of nitrogen fertilizer up to 180 kg N ha^{-1} significantly increased grain yield of rice in the two seasons of study (Table 10). The lowest grain yield was recognized when rice plants were fertilized by 60 kg N ha^{-1}.

Table 10. 1000-Grain weight and grain yield of rice genotypes as affected by different of nitrogen levels in 2015 and 2016 seasons.

Treatments / Characters	1000-grian weight(g)		Grain yield(t ha^{-1})	
Kg N ha^{-1}	2015	2016	2015	2016
60	26.5c	26.8c	9.0c	8.6c
120	26.8b	27.1b	9.5b	9.0b
180	27.8a	28.2a	10.5a	9.9a
F test	**	**	**	**
Rice genotypes				
Sakha 105	28.3a	28.6a	9.5cde	9.0cde
Sakha 106	24.9e	25.2e	9.9b	9.4b
Giza 179	27.1c	27.4c	10.8a	10.3a
GZ 9461-4-2-3-1	27.1c	27.4c	10.9a	10.4a
GZ 9626-2-1-3-2-3	27.2c	27.5c	9.1f	8.6f
GZ 9807-6-3-2-1	27.1c	27.5c	9.3def	8.8def
GZ 9399-4-1-1-3-2-2	25.9d	26.2d	9.6bcd	9.1bcd
GZ 9399-4-1-1-2-1-2	28.1a	28.4a	9.7bc	9.2bc
GZ10101-5-1-1-1	27.8b	28.1b	9.1f	8.6f
GZ 10147-1-2-1-1	27.1c	27.4c	9.2ef	8.6ef
GZ 10154-3-1-1-1	27.2c	27.5c	9.1f	8.6f
PL-GE-101-SP-26	27.0c	27.3c	9.6bc	9.1bc
Interaction N x G	**	**		**

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

Grain yield in fact, is the out-product of its main components. Any increase in one or more of the components without decrease in the others will lead to an increase in grain yield. Therefore, the increase in grain yield due to applying nitrogen was the logical result due to achieving increase in yield components, i.e., number of panicles hill^{-1} and number of filled grains panicle^{-1}. The present data are in a good agreement with those claimed by Shivay and Singh.(2003), Zayed *et al.*(2005), Zayed *et al.*(2006), Hasanuzzaman *et al.* (2012) and Ritesh *et al.* (2014).

Regarding rice genotypes performance, the tested rice genotypes significantly varied in their rice grain yield in 2015 and 2016 seasons (Table10). GZ 9461-4-2-3-1 gave the highest values of rice grain yield without any significant differences with those exerted by Giza 179 rice variety in both seasons. On the other hand Sakha 105 rice variety had the minimum mean of grain yield in 2015 and 2016 seasons (Table 10). The detected variation among the tested rice genotypes is mainly due to genetic background. El-Refaee (2007), Zayed *et al.* (2007), Abdallah *et al.* (2013) and Zayed *et al.* (2014)discriminated similar findings.

The interaction between rice genotypes and nitrogen levels significantly affected 1000 grain weight (g) and grain yield (t ha^{-1}) in both seasons. The heaviest 1000 grain weight was obtained by GZ10101-5-1-1-1 when it was received 180 kg N ha^{-1}. On the other side, the lighter 1000- grain weight was produced by Sakha106 rice variety under 60 kg N ha^{-1} (Table 11). The highest grain yield value was obtained with 180 kg N ha^{-1} by both GZ9461 and Giza 179, since they gave the same and the highest values in both seasons (Table 12).

Table 11.1000-grain weight (g) of rice as affected by rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1}			2016 Kg N ha^{-1}		
	60	120	180	60	120	180
Sakha 105	28.8abc	27.8fgh	28.2def	28.5abc	28.1fgh	29.1def
Sakha 106	24.9s	25.0r	28.8ab	24.1s	25.3r	28.2ab
Giza 179	26.9klm	26.9j-m	27.4h-k	27.7klm	27.2j-m	27.2h-k
GZ 9461-4-2-3-1	27.2i-l	26.7l-p	27.4hij	27.7i-l	27.0l-p	27.5hij
GZ 9626-2-1-3-2-3	28.0efg	25.3qr	28.2def	28.5efg	25.6qr	28.3def
GZ 9807-6-3-2-1	27.1i-l	26.9lmn	27.5hi	27.8i-l	27.2lmn	27.4hi
GZ 9399-4-1-1-3-2-2	25.1qr	26.2p	26.3op	26.6qr	26.5p	25.4op
GZ 9399-4-1-1-2-1-2	28.3c-f	27.4hij	28.6bcd	28.9c-f	27.7hij	28.6bcd
GZ10101-5-1-1-1	26.4nop	27.7gh	29.2a	29.5nop	27.6gh	26.77 a
GZ 10147-1-2-1-1	25.6q	28.9ab	26.9lmn	27.2q	29.2ab	25.9lmn
GZ 10154-3-1-1-1	26.8l-o	26.5m-p	28.3cde	28.6l-o	26.8m-p	27.1cde
PL-GE-101-SP-26	28.8abc	27.8fgh	28.2def	28.5abc	28.1fgh	29.1def

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

Table 12. Grain yield (t ha^{-1}) as affected by rice genotypes and different nitrogen levels in 2015 and 2016 seasons.

Rice genotypes / N-levels	2015 Kg N ha^{-1}			2016 Kg N ha^{-1}		
	60	120	180	60	120	180
Sakha 105	8.1p	8.8hi-o	10.1bc	7.9p	8.5h-o	9.8bc
Sakha 106	8.9g-m	9.1f-i	10.0bc	8.6g-m	8.8f-i	9.7bc
Giza 179	9.3e-h	10.0bc	11.5a	9.0d-g	9.7bc	11.2a
GZ 9461-4-2-3-1	9.5c-f	10.3b	11.5a	9.2c-f	10.0b	11.2a
GZ 9626-2-1-3-2-3	8.6j-p	8.4m-p	8.9g-n	8.3j-p	8.1m-p	8.6g-n
GZ 9807-6-3-2-1	8.3nop	8.7i-p	9.3d-g	8.0nop	8.5i-p	9.0defg
GZ 9399-4-1-1-3-2-2	8.5m-p	8.9g-m	9.9bcd	8.2m-p	8.6g-m	9.6bcd
GZ 9399-4-1-1-2-1-2	8.4nop	9.1f-k	10.2b	8.1nop	8.9f-k	9.9b
GZ10101-5-1-1-1	8.2p	8.5m-p	9.0f-l	7.9p	8.2m-p	8.7.0f-l
GZ 10147-1-2-1-1	8.3op	8.5k-p	9.1f-i	8.0op	8.2k-p	9.0d-g
GZ 10154-3-1-1-1	8.2op	8.5l-p	9.1f-j	7.9op	8.2l-p	8.9f-j
PL-GE-101-SP-26	8.8h-o	8.9g-m	9.8b-e	8.3h-o	8.6g-m	9.6b-e

In column values designated by the same letter are not significantly different at the 0.05 level according to Duncan's multiple range test.

It could be concluded that all tested rice genotypes get it full yield potentiality when they were fertilized with higher nitrogen level of 180 kg N ha^{-1}.

REFERENCES

Abdallah, A.A.; Sh.A. Badawy and A.M. Elekhtear (2013). Evaluation of some rice genotype under water stress environments .Egypt. J. plant breed.17(3): 113-127.

El-Refaee, I.S.H. (2007). Effect of cut–off irrigation date on grain yield and quality of some Egyptian rice cultivars. J. Agric. Res. Kafr El-Sheikh Univ., 33(1):123-139.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Researches. 2nd., John Wiley & Sons. U.S.A. Pak.

Hasanuzzaman, M.; M.H. Ali1; M.F.Karim; S.M. Masum and J.A.Mahmud (2012). Response of hybrid rice to different levels of nitrogen and phosphorus. 3(12):2522-2528.

Manzoor Z.; T.H. Awan; M. A. Zahid and F.A. Faiz(2006). Response of rice crop (super basmati) to different nitrogen levels. J. Anim. Pl. Sci., 16(1-2):52-55.

Meena, S.L.; S. Singh; and Y.S.Shivay (2003). Response of hybrid rice (*oryza sativa)* to nitrogen and potassium application in sandy clay-loam soils. *Indian J.* Agric. Sci. 73(1):8-11.

Metwally, T.F.; S.A.A. Hammoud; M.M.H. EL-Malky and S.M. Bassiouni(2014). Genetic variability and performance of some promising rice genotypes as affected by nitrogen fertilizer under salt stress condition. Munufiya J. Agric. Res., 39(2): 685-702.

Ritesh , S .R.K. Gangwar; V. Yadav and R. Kumar(2014). Response of Basmati (Oryza sativa) cultivars to graded nitrogen levels under transplanted conditions.. International J. of Res. in Applied, Natural and Social Sci., 2 (9): 33-38.

Shivay,Y.S.and S.Singh(2003). Effect of planting geometry and nitrogen level on growth ,yield and nitrogen –use efficiency of scented hybrid rice(*Oryza sativa*). Indian J.of Agro., 48(1):42-44.

Zayed B.A.; A.K. Salem and O. A. M. Ali (2014). Physiological characterization of Egyptian salt tolerant rice varieties under different salinity levels.Life Sci. J., 11(10):1264-1272.

Zayed B.A.; A.M. El Ekhtyar; A.B.El Abd and M.A. Badawi (2006).Response of hybrid and inbred rice varieties to various nitrogen levels under saline soil conditions .J. Agric. Sci., Mansoura Uni.,31(12):7497-7509.

Zayed, B.A.; I.S. El-Refaee; R.N. Gorgy and A.A.M. Abd El–Rahman(2005). Effect of sowing dates, plant spacing and nitrogen levels on growth and yield of rice under saline soil .The 11th Conf. of Agron., Agron. Dept., Fac. Agric., Assuit Univ.,Nov.15-16 P:265-283.

Zayed, B.A.; S.M. Shehata.; A.A. Abd Allah and W.M. El-Khoby (2007). Growth and grain yield of hybrid and traditional rice as affected by splitting nitrogen under saline soil conditions. J. Agric. Res. Kafer El-Sheikh Univ., 33(4)787-806.

استجابة بعض سلالات الأرز لمعدلات مختلفه من السماد النيتروجيني

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أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بسخا كفر الشيخ، مصر خلال موسمي ٢٠١٥ و ٢٠١٦ وذلك لدراسة سلوك بعض سلالات الأرز المختلفة وهي Sakha 105, Sakha 106, Giza 179, GZ 9461-4-2-3-1, GZ 9626-2-1-3-2-3, GZ 9807-6-3-2-1, GZ 9399-4-1-1-3-2-2, GZ 9399-4-1-1-2-1-, GZ10101-5-1-1-1, GZ 10147-1-2-1-1,GZ 10154-3-1-1-1and PL-GE-101-SP-26 تحت ثلاث مستويات من التسميد النيتروجيني وهي ٦٠، ١٢٠ و ١٨٠ كجم / هكتار. نفذت التجربة في الشرائح المتعامدة فى أربعة مكررات حيث تم إضافة معدلات النتروجين في القطع الرأسية و سلالات الأرز في القطع الأفقية. تم تقدير المحصول و مكوناته عند الحصاد. و يمكن تلخيص أهم النتائج المتحصل عليها . أثرت معدلات النيتروجين معنويا علي جميع الصفات المدروسة في كلا موسمي الدراسة واستجابة جميع الصفات المدروسة معنويا للزيادة التدريجية في النيتروجين حتي ١٨٠ كجم / هكتار في كلا موسمي الزراعة ، وفى نفس الوقت كان هناك تباين واضح بين السلالات المختلفة تحت الدراسة حيث أعطي PL-GE-101-SP-26 أطول النباتات بينما اقصرها كان من إنتاج سخا ١٠٥ وأعطى GZ 9461-4-2-3-1 أطول السنابل وأكبرعدد من الأفرع وعدد السنابل وعدد الحبوب الممتلئة ومحصول الحبوب ومحصول القش في كلا موسمي الدراسة. وجد ان الصنف الاخير مع جيزة ١٧٩ كان علي نفس الدرجه من المعنويه في محصول الحبوب في عامي الدراسة. وجد ان GZ10147 أعطي أطول فترة من الزراعةحتي طرد السنابل. وجد ان التفاعل بين السلالات و معدلات النتروجين أثر معنويا علي جميع الصفات المدروسة في كلا موسمي الدراسةوكان هناك استجابة من جميع السلالات للتسميد النيتروجيني حتي ١٨٠ كجم نيتروجين/ هكتار .