Determination of Grain Quality Characters of Some Egyptian Rice Cultivars Under Low Levels of Nitrogen Fertilizer

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ABSTRACT

Tow field experiments on rice crop *(Oryza sativa,* L.*)* were conducted during two summer growing seasons, 2016 and 2017 at the Experimental Farm of Rice Research and Training Center (RRTC); Sakha, Kafr El-Sheikh Egypt in cooperation with Rice Training and Technology Center (RTTC),Alexandria, Egypt to study grain quality traits of some Egyptian rice cultivars grown under low fertilizer levels . The results revealed that increasing nitrogen fertilization caused significant increase in the mean values of the most studied characters. In connection, decreasing such fertilizer levels to 50% of the recommended rates did not affect the mean values of some tested cultivars of most studied characters.

Key words: Rice Production- Gelatinization- Cultivars.

INTRODUCTION

Rice (*Oryza sativa,* L.) is one of the most important staple food crops of the world. More than two thirds of the world relies of nutritional benefit of rice. In Egypt, rice is considered as one of the most essential field crops , not only as a food crop , but also a land reclamation crop and for exportation.

Rice production depends on several factors: climate, physical conditions of the soil, soil fertility, water management, sowing date, cultivars, seeding rate, weed control, and fertilization (Angus *et al*. 1994 , Jing *et al*. 2008, El-Dalil et al.2017).

The profitability of rice production systems depends on yield and input quantities. Since fertilizer is an expensive and precious input, determination of an appropriate dosage of application that would be both economical and appropriate to enhance productivity and consequent profit of the grower under given situation needs intensive study.

Nitrogen (N) is one of the most essential nutrients in agricultural production. Over the past several decades, the intensive use of synthetic N fertilizers combined with high-yielding varieties, irrigation, and agrochemicals for plant protection has resulted in a significant increase in productivity of major cereal crops such as rice (*Oryza sativa* L.). If properly applied, N also contributes to grain filling by improving the photosynthetic capacity and enhancing carbohydrate accumulation in culms and leaf sheaths (Mae, 1997). Thus, N has been recommended as a core fertilizer for rice in order to improve yields. However, mere increases in N applications do not guarantee yield improvement.

The present investigation aimed to study the grain quality of some Egyptian rice cultivars grown under different nitrogen fertilizer levels including lower and higher levels than the recommended dose as a step to breed low input rice varieties .

MATERIALS AND METHODS

Two field experiments on rice *(Oryza sativa,* L.*)* were conducted during two summer growing seasons, 2016 and 2017 at the Research Farm of the Rice Research and Training Center (RRTC); Sakha , Kafr El-Sheikh, in cooperation with the Rice Training and Technology Center (RTTC),Alexandria, Egypt to study the grain quality of some Egyptian rice cultivars grown under low fertilizer levels as a first step to breed for low input rice cultivar.

Treatments and experimental field design:

Three rice cultivars namely; Giza 177(Japonica), Giza 178(Indica), and Giza 182 (Indica/Japonica) were utilized in the present study. These cultivars were tested under four levels of nitrogen . These rates were; 0, 50%, 100% and 150% of the recommended rate of each fertilizer.

Statistical design for the two experiments was Split plot design in three replicates. Rice cultivars represented the main plot treatments; while the nitrogen fertilization rates represented the sub-plot. The total experimental units were (4 x 4 x 3) = 48 plots with plot area of 1 m in width x 5 m in length (5 m^2) and distance between rows was 20 cm.

Seeds of the tested entries were directly drilled with the seed rate of 50 kg/fed, for the two seasons .

Nitrogen fertilization, as Urea [CO $(NH_2)_2$ – 46.5%N] with the above mentioned rates were added in three equal doses; the first a basal application and incorporated into soil then immediately the soil was flooded. The second dose was applied at 21 days after seeding, and the third dose was added at 45 days after the first one.

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Phosphorus fertilization, as calcium super phosphate (15.5% P_2O_5) with the rate of 15.5 kg P_2O_5/fed was added to the soil before tillage.

Irrigation water requirements and irrigation intervals as well as all the other agronomic practices have been applied according to the recommended methods of rice production.

Soil analysis:

The previous crop was barley in the two seasons of study. Soil sampling (0-30 cm depth) representing the experimental sites, has been done before planting for determining mechanical and chemical characteristics.

All the soil fertility characteristics determinations were done according to the standard methods mentioned by Chapman and Pratt (1961), Black (1965) and Jackson (1972). The obtained resulted are presented in (Table 1) as follows:

Table1. Soil mechanical and chemical properties of the two experimental sites in 2016 and 2017 seasons

Soil experimental site	2016	2017
A- Mechanical analysis		
Sand %	18	20.4
Silt %	26.4	27.1
Clay %	55.6	52.5
Soil texture class	Clayey	Clayey
B- Chemical analysis		
Saturation percentage (SP)	73.06	71.60
ECe (Soil past at 25^0C)	2.02	2.30
Soil-pH (1:2.5 susp.)	8.17	8.03
$CaCO_3$ (Calci meter method) %	2.27	2.43
Soil ECE (c mol/kg)	30.50	29.80
Soil-O.M. (Walkly & Black)%	1.65	1.53
Available N (K-sulfate extract.) ppm	66.34	57.07
Available Zn (DTPA-sulfate extract.) ppm	0.91	0.83

Studied Characters:

1. Grain appearance characters:

A. Grain length (L) (mm): The average of ten well formed brown grains (after dehulling), was measured from the base to the top of these grains by "Micrometer" according to Chang and Bardenas (1965).

B. Grain width (W) (mm): It was measured as the average of ten brown grains (after dehulling) as the distance between the two sides at the widest point of the grain according to Chang and Bardenas (1965).

C. Grain shape (L/W ratio):

Grain shape was expressed as the ratio between grain length and width. The following Scale was suggested by Khush *et al.* (1979) to describe the grain shape.

Table 2. Scale of rice grain shape (length/ width ratio)

Scale	Shape	Length/width ratio
1	Slender	Over 3.1
3	Medium	2.1 to 3.0
5	Bold	1.1 to 2.0
9	Round	1.0 or Less

2. Milling characters: were estimated according to the methods reported by Adair (1952).

A. Hulling percentage (%):

$$\text{Hulling \%} = \frac{\text{Brown rice weight}}{\text{Rough rice weight}} \times 100$$

B. Milling percentage (%):

$$\text{Milling \%} = \frac{\text{Milled rice weight}}{\text{Rough rice weight}} \times 100$$

C. Head rice percentage (%):

$$\text{Head rice \%} = \frac{\text{Whole grain weight}}{\text{Rough rice weight}} \times 100$$

3. Cooking and eating characters:

A. Gelatinization temperature (G T):

Six grains of whole milled rice in duplicate were placed in boxes containing 1.7% KOH and arranged so that the kernels do not touch each. The boxes were covered and incubated for 23 hours at 30˚c. The appearance and disintegration of endosperm were graded visually on the basis of the following numerical scale temperature below 70˚c (Little *et al.* 1958). The appearance and disintegration of the endosperm were graded visually on the basis of the following numerical scale:

Table 3. Rates of gelatinization temperature character of rice

Rating	Separation	Cleaning
1	Kernel not affected	Kernel chalky
2	Kernel swollen	Kernel chalky, collar powdery
3	Kernel swollen, collar incomplete or narrow	Kernel chalky, collar cottony or cloudy
4	Kernel swollen, collar complete and wide	Center cottony, collar cloudy
5	Kernel split or segmented: collar complete and wide	Center cloudy, collar clear
6	Kernel dispersed; margin with collar	Center cloudy, collar clear
7	Kernel completely dispersed and intermingled	Center and collar cleared

B. Kernel elongation (%):

Kernal elongation percentage measured according to this formula:

$$\text{Kernal Elongation \%} = \frac{\text{Grain Avg.length b.c.} - \text{Grain Avg.length a.c.}}{\text{Grain Avg .lenght b.c.}} \times 100$$

<u>Whereas</u>: b.c: Before cooking a.c: After cooking

C. Amylose content (%):

amylose content was determined following the method of (Williams *et al.*, 1958). A scale was used for classifying amylose content (A C) according to IRRI (2009):

Table 4. Classes of amylose content of rice

7 – 11 %	:	Very low amylose.
11 – 20 %	:	Low amylose.
20 – 25 %	:	Intermediate amylose.
> 25 %	:	High amylose

Statistical analysis:

The analysis of variance was carried out according to Gommez and Gomez (1984). Statistical analyses was performed using analysis of variance technique by means of "CO-STAT" computer software package. Treatment means were compared by the least significant differences (LSD) test as given by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The present investigation was carried out at the Experimental Farm of the Rice Research and Training Center, field crops Research institute, A.R.C during the two growing seasons 2016 and 2017. The study aimed to study the performance of some Egyptian rice cultivars under low nitrogen fertilization levels.

Grain appearance characters:

A) Grain length (L) (mm):

a. Cultivar effects:

As shown in Table (5), rice cultivars were significantly differed in grain length in the two seasons, the results indicated that Giza 182 rice cultivar (Indica) had significantly the longest grain compared with the other rice cultivars under this study. The difference among these cultivars regards grain length may be attributed to their genetic structure .

b. Nitrogen fertilization rate effects:

In addition, data in Table (5) showed that the grain length did not significantly differ as affected by nitrogen levels in the two seasons of study. This result indicates that this character is genetically governed with low effect of environment. These findings are in contrary with Devi *et al*. (2012), who reported that kernel length and breadth significantly increased with increasing nitrogen levels .

B) Grain width (W) (mm):

a. Cultivar effects:

As indicated in Table (5), the mean values of grain width of the rice cultivars were significantly differed in both seasons. The results indicated that Giza 177 rice cultivar (Japonica) had significantly the widest grain compared with the other rice cultivars under study.

b. Nitrogen fertilization rate effects:

In addition, data in that table showed that the grain width were significantly widest in plots were fertilized with 100% of the recommended nitrogen fertilization rate than the other nitrogen applications in the second season, only.

c. Interaction effects:

The interaction between cultivars and nitrogen fertilization rate showed insignificant effect on grain width in the two seasons.

C) Grain shape (L/W ratio):

a. Cultivar effects:

As indicated in Table (5), rice cultivars were significantly varied in grain shape in the two seasons. In addition, the results demanstrated that Giza 182 rice cultivar (Indica) recorded the highest shape compared with the other rice cultivars under this study. This was expected because it belonged to the longest grain cultivars. The difference among these cultivars regarding grain shape may be attributed to genetic variation among these cultivars.

Table 5. Grain length (L) (mm), grain width (W) (mm) and grain shape (L/W ratio) as affected by cultivar, nitrogen fertilization rate and their interactions during 2016 and 2017 seasons

Character	Grain length (L)(mm)		Grain width (W)(mm)		Grain shape (L/Wratio)	
Season	2016	2017	2016	2017	2016	2017
Rice Cultivar (C):						
Giza 177(J)	5.63	5.40	2.91	2.91	1.93	1.86
Giza178(J/I)	5.17	4.94	2.53	2.37	2.04	2.08
Giza 182(I)	6.85	6.23	2.33	2.13	2.94	2.92
F-test	*	*	*	*	*	*
LSD at 0.05	0.07	0.08	0.06	0.04	0.04	0.05
Nitrogen fertilization rate (N):						
0	5.77	5.41	2.72	2.54	2.12	2.13
50	5.77	5.42	2.73	2.60	2.13	2.12
100	5.78	5.43	2.78	2.63	2.09	2.08
150	5.79	5.44	2.76	2.59	2.11	2.12
F-test	NS	NS	NS	*	NS	NS
LSD at 0.05	-	-	-	0.03	-	-
Interaction:						
C x N	*	*	NS	NS	N.S	N.S

* and NS indicate significant at $P < 0.05$ and not significant, respectively.

b. Nitrogen fertilization rate effects:

In addition, data in Table (5) showed that the grain shape didn't affect by nitrogen application levels in the two seasons of study. This result indicates that this character is genetically governed with low effect of environment. El-Siginy (2004) confirmed this result that grain shape character didn't affect by nitrogen levels. El-Nory (2008) and Islam *et al*. (2008) found that increasing nitrogen rates led to significant increase of grain shape in both seasons.

Milling characters:

A) Hulling percentage (%):

a. Cultivar effects:

Data in Table (8) indicated that significant differences between rice cultivars were recorded in the two seasons for hulling percentage. Giza 177 cultivar had the highest hulling percentage compared with the other two rice cultivars ,i.e. Giza 178and Giza 182. These differences might be due to almost the genetically differences.

b. Nitrogen fertilization rate effects:

The analysis of variance of the data resulted in 2016 and 2017 seasons showed that varying nitrogen levels caused significant differences in hulling % as listed in Table (6). The highest percentage of hulling was obtained at 100% of the recommended nitrogen fertilization rate in both seasons of study.

It is obvious that increasing nitrogen level might improve grain filling processes at the caryopsis of the spikelet's which caused harvest brown rice and lightest hulls. These results are in line with those reported by Ebaid and El-Hissewy (2001), they indicated that hulling was significantly increased as nitrogen level increased up to 165 kg N/ha. Abd El-Hamed (2002) and Devi *et al*. (2012) , also observed similar response.

c. Interaction effects:

No significant interaction between cultivars and nitrogen levels on hulling percentage was obtained in both seasons. Shaalan (2009) recorded insignificant interaction between rice cultivars and N-levels on both hulling and milling percentages.

B) Milling percentage(%) :

a. Cultivar effects:

It was clear from Table (6) that the differences between the three tested rice cultivars regarding milling (%) character were significant in the two seasons. Giza 177 (Japonica) rice cultivar recorded the highest mean values on milling percentage (71.85 and 70.36 %) while Giza 182 rice cultivar (Indica) recorded the lowest values (67.99 and 67.47 %) in the two successive growing seasons, respectively. This difference in milling percentage (%), which obtained among different rice cultivars might be due to almost their genetic background.

b. Nitrogen fertilization rate effects:

Data in Table (6) revealed that the highest values of milling(%) were, also realized by using the treatment of 100% of the recommended nitrogen fertilization rate.

Table 6. Hulling (%), Milling (%) and Head rice (%) as affected by cultivar, nitrogen fertilization rate and their interactions during 2016 and 2017 seasons

Character	Hulling (%)		Milling (%)		Head rice (%)	
Season	2016	2017	2016	2017	2016	2017
Rice Cultivar (C):						
Giza 177(J)	81.02	80.18	71.85	70.36	66.81	65.63
Giza178(J/I)	78.63	78.77	68.54	68.68	62.49	62.33
Giza 182(I)	77.98	77.96	67.99	67.47	59.52	58.77
F-test	*	*	*	*	*	*
LSD at 0.05	0.52	0.81	0.56	0.43	1.06	0.84
Nitrogen fertilization rate (N):						
0	78.34	78.07	68.82	67.48	60.91	59.52
50	79.50	79.10	69.80	68.79	63.39	62.65
100	80.59	80.05	71.41	70.73	66.43	65.83
150	80.08	79.70	70.36	69.81	64.89	65.14
F-test	*	*	*	*	*	*
LSD at 0.05	0.77	0.68	0.63	0.74	0.87	1.06
Interaction:						
C x N	NS	NS	NS	*	*	NS

* and NS indicate significant at $P < 0.05$ and not significant, respectively.

Nitrogen fertilization rate had significant effect on milling percentage in 2016 and 2017 seasons.

The effect of nitrogen fertilization on milling percentage (%) may be due to improving growth, photosynthesis, net assimilates and grain filling at the recommended nitrogen level, only. Both decreasing and/or increasing nitrogen level than the recommended significantly affect milling%. Abd El-Hamed (2002) and Devi *et al*. (2012) also observed similar response.

c. Interaction effects:

The interaction between rice cultivars and nitrogen fertilization rates treatments on milling percentage (%) was significant in the second season only. Giza 182 rice cultivar can produce the same insignificant difference between the mean values at 50% and the recommended level of nitrogen.

Table 7. Milling percentage (%) as affected by cultivar x nitrogen fertilization rate interaction in 2017 season

Nitrogen fertilizer rate	2017		
	Cultivar		
	Giza 177	Giza 178	Giza 182
0	68.41	66.97	66.36
50	70.11	68.33	67.35
100	72.11	69.96	68.08
150	70.83	69.45	68.10
LSD at 0.05		1.18	

c) Head rice percentage (%):

a. Cultivar effects:

In both seasons, there were significant differences among rice cultivars on head rice percentages (%) as shown in Table (6). Giza 177 rice cultivar produced the highest head rice percentages (66.81 and 65.63), while Giza 182 rice cultivar gave the lowest head rice percentage (59.52% and 58.77%) in the two seasons, respectively. This could be attributed to the differences in grain length between Giza 182 rice cultivar and the other cultivars.

b. Nitrogen fertilization rate effects:

The results regarding head rice percentage as affected by various levels of nitrogen fertilizer are presented in Table (6). Nitrogen fertilization rate was significantly affecting the head rice in both seasons. It decreased head rice percentage from (66.43% and 65.83%) (100% of the recommended nitrogen fertilization rate) to (64.89% and 65.14%) by applying (150% of the recommended nitrogen fertilization rate) and (63.39% and 62.65%) by using (50% of the recommended nitrogen fertilization rate) .

c. Interaction effects:

The interaction between rice cultivars and nitrogen fertilization rate treatments effect on head rice percentage (%) was significant in the first season ,only. It is worthy to note that the mean values of the tested cultivars were gradually increased with increasing N level up to the recommended dose and then decreased when it increased to 150% of the recommended. This could be attributed to increase N level produced more brittle caryopsis that led to high broken percentage.

Table 8. Head rice percentage (%) as affected by cultivar x nitrogen fertilization rate interaction in 2016 season

Nitrogen fertilizer rate	2016		
	Cultivar		
	Giza 177	Giza 178	Giza 182
0	64.76	58.15	56.77
50	66.59b	61.60	58.14
100	68.89a	66.23b	62.13
150	66.99b	64.00	59.95
LSD at 0.05		1.76	

c. Interaction effects:

The interaction between rice cultivars and nitrogen levels had no significant effect on gelatinization temperature (GT) was in 2016 and 2017 seasons .

B. Kernel elongation (%):

a. Cultivar effects:

Kernel elongation is one of the major determinants of cooking and eating quality characters of rice. Data in Table (9) revealed that rice cultivars significantly varied in their elongation during both seasons. Giza 178 rice cultivar (J/I) produced the highest values of kernel elongation, while the lowest values were recorded for Giza 182 rice cultivar (Indica) in the two seasons. This varietal variation might be due to their differences in their genetic makeup.

Cooking and eating characters effect :

A) Gelatinization temperature (GT):

a. Cultivar effects:

The behavior of rice cultivars significantly differed regarding gelatinization temperature (GT) in the second season; whereas, Giza 182 rice cultivar gave the highest values of gelatinization temperature. It is worthy to mention that the low gelatinization temperature (GT) cultivars had soft cores and require less water and shortest time for cooking.

b. Nitrogen fertilization rate effects:

The results showed gelatinization temperature (GT) as affected by various levels of nitrogen fertilizer is presented in Table (9). Nitrogen fertilization rate had significant effect on the gelatinization temperature in the second season only. It decreased gelatinization temperature from (6.40) by using the recommended nitrogen fertilization rate to (6.10) by applying 50% of the recommended and (6.08) without nitrogen fertilization. This might be explained that decreasing N level could produce hard starch granules that need more time to be well digested.

Table 9. Gelatinization temperature (GT), Kernel elongation (%) and Amylose content (%) as affected by cultivar, nitrogen fertilization rate and their interactions during 2016 and 2017 seasons

Character	Gelatinization temperature (GT)		Kernel elongation (%)		Amylose content (%)	
Season	2016	2017	2016	2017	2016	2017
Rice Cultivar (C):						
Giza 177(J)	6.58	6.00	39.40	39.77	19.28	18.70
Giza178(J/I)	6.91	6.00	40.57	42.14	18.65	17.92
Giza 182(I)	6.91	6.75	36.57	34.87	20.72	19.76
F-test	N.S	*	*	*	*	*
LSD at 0.05	-	0.41	0.82	1.07	1.09	0.53
Nitrogen fertilization rate (N):						
0	6.50	6.08	38.66	39.07	19.65	19.19
50	6.58	6.10	40.05	41.03	20.21	19.43
100	6.75	6.40	36.84	37.23	19.87	19.32
150	6.41	5.80	38.76	39.51	19.96	19.41
F-test	NS	*	*	*	*	NS
LSD at 0.05	-	0.28	0.50	0.52	0.34	-
Interaction:						
C x N	NS	NS	*	*	*	*

* and NS indicate significant at $P < 0.05$ and not significant, respectively.

c. Interaction effects:

The interaction between rice cultivars and nitrogen levels had no significant effect on gelatinization temperature (GT) was in 2016 and 2017 seasons .

B. Kernel elongation (%):

a. Cultivar effects:

Kernel elongation is one of the major determinants of cooking and eating quality characters of rice. Data in Table (9) revealed that rice cultivars significantly varied in their elongation during both seasons. Giza 178 rice cultivar (J/I) produced the highest values of kernel elongation, while the lowest values were recorded for Giza 182 rice cultivar (Indica) in the two seasons. This varietal variation might be due to their differences in their genetic makeup.

b. Nitrogen fertilization rate effects:

The analysis of variance of the date resulted in 2016 and 2017 seasons, showed that varying nitrogen levels caused significant differences in kernel elongation (%) in all tested cultivars as listed in Table (9).

c. Interaction effects:

The interaction between rice cultivars and nitrogen fertilization rates treatments on kernel elongation % was significant in both seasons, (Table 10). In 2016 season, there were insignificant differences between the mean values of kernel elongation (%) between 50% and 100% of the nitrogen levels regarding Giza 178 and Giza 182, indicating that one of the most important cooking and eating quality characters will not affected by applying 50% of the recommended nitrogen fertilizer.

C. Amylose content (%):

a. Cultivar effects:

Amylose content (%) is the major determinant of cooking and eating quality characters of rice. Data in Table (9) revealed that rice cultivars significantly varied in their amylose content (%) during both seasons.

b. Nitrogen fertilization rate effects:

The analysis of variance of the date obtained in 2016 and 2017 seasons, showed that varying nitrogen levels caused significant differences in amylose content (%) in first season only, This could be reflect the differences of the environmental conditions prevailed in the first season together with the different nitrogen level caused change in the starch granules formation and disturbed the ratio between the amylose and amylopectin.

c. Interaction effects:

The interaction between rice cultivars and nitrogen fertilization rate treatments effect on amylose content (%) was significant in both seasons, (Table 11).

Looking to the effect of decreasing the nitrogen level from the recommended to 50%, the mean values of amylose content were not changed significantly in case of Giza 178 rice cultivars in 2016 season, and for all rice cultivars 2017 season.

Table 10. Kernel elongation (%) as affected by cultivar x nitrogen fertilization rate interaction in 2016 and 2017 seasons

Nitrogen fertilizer rate	2016			2017		
	Cultivar					
	Giza 177	Giza 178	Giza 182	Giza 177	Giza 178	Giza 182
0	36.25	42.89	35.94	38.33	44.19	35.19
50	41.53	37.83	37.32	41.57	43.58	35.26
100	37.02	36.71	36.84	36.79	33.63	35.24
150	42.81	44.84	36.20	42.39	41.57	35.41
LSD at 0.05		1.94			2.52	

Table11. Amylose content (%) as affected by cultivar x nitrogen fertilization rate interaction in 2016 and 2017 seasons

Nitrogen fertilizer rate	2016			2017		
	Cultivar					
	Giza 177	Giza 178	Giza 182	Giza 177	Giza 178	Giza 182
0	18.52	18.79	20.60	17.53	18.12	19.78
50	18.81	18.88	21.48	18.84	18.21	20.22
100	20.19	18.50	20.54	19.62	18.43	20.63
150	19.60	18.44	20.27	18.84	17.87	18.44
LSD at 0.05		0.92			1.13	

This led to the conclusion that this vital cooking and eating quality character will not harmfully affected by decreasing the nitrogen level to 50% of the recommended.

Finally, it can be summarized that there were highly significant differences between the mean values of all utilized cultivars regarding all the quality characters under study in the two seasons. This was attributed to their genetic back ground.

Additionally, it is revealed that all studied characters increased gradually by increasing nitrogen fertilization levels till they maximized at the highest level (100% of the recommended rate).

Different results were obtained for the interaction between cultivars and nitrogen fertilization levels. In the two seasons, this interaction was significant for grain length, grain shape, kernel elongation and amylose content. While, it was not significant in case of grain width, hulling (%) , and gelatinization temperature in the two seasons. Meanwhile, it was worthy to note that the interaction was significant in one season only in 2017season, for head rice (%).

From another point of view, the results revealed that decreasing the nitrogen level from the recommended dose to 50% of the recommended did not affect the mean values of most of studied characters in case of Giza 178 in the two seasons. This result indicated that this cultivar could be recommended as low input cultivar.

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الملخص العربي

تقدير صفات جودة الحبوب لبعض أصناف الأرز المصرية المنزرعة تحت المستوايات المنخفضة من السماد النيتروجيني

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أقيمت تجربتان حقليتان لمحصول الأرز خلال الموسمين الزراعيين ٢٠١٦و٢٠١٧ وذلك فى المزرعة البحثية بمركزبحوث و تدريب الأرز (RRTC) بسخا- كفرالشيخ بالأشتراك مع مركز تدريب و تكنولوجيا الأرز (RTTC) الأسكندرية -مصر. لدراسة صفات جودة حبوب بعض أصناف الأرز المصرية المنزرعة تحت الإحتياجات السمادية المنخفضة كخطوة أولى للتربية لأصناف أرز ذات إحتياجات سمادية منخفضة.

- التصميم الإحصائى التجريبي هو القطع المنشقه فى ثلاثه مكررات.
- **الصفات تحت الدراسة:**

١- صفات الجودة: الصفات الظاهرية للحبة، صفات التبييض ، صفات الطبخ و الأكل.

- تم إستخدام ثلاثة أصناف مصرية، وهي (جيزة ١٧٧، جيزة١٧٨و جيزة ١٨٢) .
- تم اختبار هذه الأصناف تحت أربعة معدلات من التسميد النيتروجيني وهذه المعدلات هى (صفر، ٥٠%، ١٠٠% و ١٥٠%) من المعدل الموصى بها .

**** ويمكن إيجاز أهم النتائج والإستنتاجات المتحصل عليها في الآتي :**

يمكن الإستنتاج بأنه يوجد إختلافات معنوية بين القيم المتوسطة للأصناف المستخدمة فيما يتعلق بصفات النمو الخضرية تحت الدراسة فى الموسمين. وهذا يرجع إلى تاريخها الوراثي ،بالإضافه إلى ذلك فإنه تم التعرف على أن كل الصفات تحت الدراسة كانت تزيد قيمتها تدريجيا معنويا بزيادة مستويات التسميد النيتروجيني حتى تنتظم تلك القيم عند المستوى الأعلى (١٠٠% من المعدل الموصى به).

و تم الحصول على نتائج مختلفه بالنسبه للتفاعل بين الأصناف ومستويات التسميد النيتروجيني بالنسبه لموسمي الزراعة، حيث كان التفاعل معنويا بالنسبه لصفات شكل الحبة، إستطالة الحبة، المحتوى الأميلوزي و مع ذلك فقد لوحظ أن ذلك التفاعل كان معنوياً فى موسم واحد فقط (فى الموسم الثانى ٢٠١٧ بالنسبه عرض الحبه و صفات التبييض).

كما أوضحت النتائج أن إنخفاض مستوى التسميد النيتروجيني عن المعدل الموصى به إلى ٥٠% من المعدل الموصى به لم يؤثر على القيم المتوسطة لمعظم الصفات المدروسة لصنف جيزة ١٧٨ فى الموسمين بالنسبه لصفات الجودة .