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RESPONSE OF HYBRID AND INBRED RICE VARIETIES TO VARIOUS NITROGEN LEVELS UNDER SALINE SOIL CONDITIONS.

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ABSTRACT

Two field experiments were conducted in the two seasons of 2005 and 2006 at the experimental farm of El Sirw Agriculture Research Station, Dammeitta, Egypt to study the response of some inbred and hybrid rice varieties (Sk 2034H ,Sk2025H ,Sk2058H ,Giza 177,Giza 178 and Sakha 104) to various nitrogen levels (0, 60, 120, 180and 240 kg N /ha).The experimental soil was clay with ECe levels of 7.89 and 8.25dS m^{-1} in 2005 and 2006 seasons respectively. The growth ,yield attributes, yield and nitrogen- use efficiencies of the tested rice varieties under the aforementioned nitrogen levels were determined. The tested rice varieties showed great variation in their growth ,yield attributing characters and grain and straw yields as well as their nitrogen use efficiencies . Hybrid rice variety of Sk2034H surpassed other tested rice varieties while the worst one was the salt sensitive variety Giza 177. Hybrid rice variety SK2034H had higher nitrogen–use efficiency than inbreeds, except physiological efficiency index of absorbed nitrogen (PIEN) where, its highest value was given by Giza 177

Increasing nitrogen levels significantly improved growth ,yield attributes and grain and straw yields. Furthermore, each unit increase in nitrogen levels led to significant increase in growth, yield attributing characters and yield of rice. The maximum grain yield was produced with the addition of 240 kg N/ ha. The nitrogen uptake , nitrogen use efficiency (NUE), apparent recovery (%) and physiological efficiency index of absorbed nitrogen (PEIN) were significantly higher at lower nitrogen level and decreased significantly with increasing N levels . The response of the investigated inbred and hybrid rice varieties to nitrogen levels significantly varied . The most rice varieties significantly responded to nitrogen up to 180 kg N/ ha . The inbred rice varieties Giza 177 and Sakha 104 significantly responded to nitrogen level up to 240 kg N/ha .

Keywords: Rice, nitrogen, growth, yield attributes, yield, nitrogen uptake, NUE, apparent recovery , PIEN.

INTRODUCTION

Rice occupies a pivotal position in the food security system in Egypt , particularly under poor quality water and soil .Increasing rice productivity under saline soil is one way for elevating rice production in Egypt. Hybrid rice was found to be more suitable for rice growing under such conditions ,where it showed higher heterosis over inbred under saline soil. For getting higher grain yield and nitrogen–use efficiency, proper nitrogen rate is the most import agronomic practice. Hybrid rice possesses higher physiological efficiencies due to its vigorous root system, greater sink size ,larger leaf are index (LAI) during grain filling and wider adaptability to varied environment with such saline soil (Yang *et al.*,1999). Chandrasekhari *et al* .(2001), Singh

.(2002), Gautam. (2004) ,have reported significantly better growth performance of hybrids than conventional varieties, particularly LAI, dry mater at heading and grain filling, plant height and panicle length .Niu *et al.*(2001) ,Bhanumathy *et al* .(2003), Patil *et al.* (2003), Gautam (2004) and Abou Khalifa. (2005) emphasized the superiority of rice hybrid over inbred one in panicle number/ plant, filled grains/ panicle, fertility percentage, panicle weight, 1000-grain weight, straw yield, grain yield and harvest index. Zayed. (1997 and 2002) found variation between rice varieties under saline soil conditions. Yang *et al* .(1999) ,Kumar.(*et al* 2002) and Singh .(2002) stated that rice hybrids had higher N uptake and nitrogen use efficiencies than those of inbred rice.

Nitrogen is a constitute of all protein and non protein components in rice. It is associated with green color of leaves, photosynthetic activity, vegetative growth and regulates rice productivity. Nitrogen normally limits rice production because crop remove large amount of nitrogen and also ,it is easily lost from soil (Prasad., 1996). Yadav *et al.* (2002), Gautam. (2004) and Zayed *et al* .(2005b) stated that increasing nitrogen level up to 165 or 225 kg N/ha significantly increased rice growth ;LAI, dry matter plant height ,number of tillers/plant and panicle length. However, Zayed *et al.*(2005b) clarified that continuous increase in nitrogen level significantly delayed heading date of rice crop. Increasing nitrogen rate pronounced raised the main yield components of rice ,panicle numbers/ plant ,grains/ panicle, panicle weight, 1000-grain weight, grain and straw yields; and harvest index (Balasubramanian., 2002, Singh., 2002, Meena *et al.*, 2003, Shivay and Singh., 2003, Gautam., 2004, and Zayed *et al.*, 2005b). Meena *et al.*(2002) and Shivay and Singh.(2003) stated that increasing nitrogen uptake with increasing nitrogen rate, while the nitrogen use efficiencies shoed the opposite trend . Subbiah *et al.*(2001) found that ProAgro 6201 recorded higher growth ,yield attributes and yield with adding 200 kg N /ha ,while in DRRH1 and ADHR2 hybrids, the increase nitrogen level over 150 kg N/ ha didn't increase grain yield significantly. Dubey and Bisen .(1989) reported that the interaction of nitrogen levels and varieties for N uptake was significant .

Thereby, the current study aimed to find out the response of some hybrid and inbred rice varieties to elevated nitrogen fertilizer levels to improve rice production under saline soil environments .

MATERIALS AND METHODS

Two field experiments were conducted during the two seasons of 2005 and 2006 at the research farm of El –Sirw Agricultural Research Station , Dammietta , Agricultural Research Center ,Egypt. The soil was clay ,having ECe of 7.89 and 8.25 dS m^{-1}, pH, 8.2 & 8.15, Na^{+1}, 46 & 50, Ca^{+2} + Mg^{+2} =31 & 29, K^{+1}, 0.32 &0.31 and the anions were as follows; HCo^{-} =8.0& 6.7,Cl=35 & 40 and So_4^{-2} 23.5 & 25.6 meg L^{-1} in 2005 & 2006 season, respectively. The total Kjedahl, N, 0.028% and 0.026 % and 13 & 12, 250 & 240 available P and K in 2005 and 2006 season, respectively. The treatments comprised the response of three hybrid rice varieties, Viz, Sk2034H, Sk2025H & Sk2058H and three inbred rice varieties Viz; Giza 177, Giza 178 and Sakha 104 to five nitrogen rates namely ; 0 ,60, 120, 180 and 240 Kg N/ ha .

The experiment was laid out in split plot design, keeping rice varieties in the main plots and the nitrogen levels in the subplots, with four replications. Seedling of 30 days of rice varieties were transplanted with 3 seedlings/hill on May, 30. Whereas the sowing was done on April, 30. Nitrogen treatments were imposed in 4 equal doses 15 days after transplanting (DAT), mid-tillering stage, panicle initiation, and end of booting stages associated with each variety as recommended under saline soil and hybrid rice. All plots were given 50 kg P_2O_5 / ha and 57 K_2O/ ha. The plot area was 10 m^2. At heading, ten hills from each plot were taken to estimate the dry mater and leaf area index (LAI). Days from sowing to heading was also estimated. At harvest, panicles of ten hills for each plot were counted to determine the panicle numbers/m^2 and also, plant height was measured. Ten main panicles from each subplot were packed to the laboratory to determine panicle length (cm) filled and unfilled grains/ panicle, and panicle and 1000-grain weights. Plants of the six inner rows of each subplots were harvested, dried, threshed and then grain and straw yields were determined at 14 % moisture content and converted into t /ha. Dried grain and straw subsamples were analyzed for Kjeldahls, Nitrogen uptake (kg /ha) was estimated as grain and straw and total (grain and straw) was estimated as product of N content and plant yield (grain, straw and total). Different estimates on N efficiencies were made by using the following calculation ;

$$\text{Apparent recovery \%} = \frac{\text{N uptake in treated plots(kg /ha)-N uptake in the control (Kg /ha)}}{\text{Amount of N applied (kg/ ha)}}$$

Physiological efficiency index of absorbed nitrogen (PEIN)of the treatments was calculated as the ratio of kg grain produced t kg of nitrogen absorbed in the above ground dry matter at harvest (Isfan 1990) .

$$\text{PEI N} = \frac{\text{Grain produced (Kg/ ha)}}{\text{N absorbed in above dry matter at harvest (kg/ ha)}}$$

Data of each season were imposed to the statistical analysis according to the statistical analysis of split plot design and differences among treatments means of the studied traits were judged by LSD at P ≤0.05% level of significance according to Gomez and Gomez (1984).

RESULTS AND DISCUSSIONS

Rice growth

Data in Table 1 show the varietal differences detected in the growth of the tested rice varieties involving hybrid and inbred ones in both seasons . It seems that Sk2034H surpassed the other investigated varieties regarding dry matter production and leaf area index (LAI), while Giza 178 (elite salt tolerant rice variety) came in the second order in dry matter and LAI. Giza 177 (salt sensitive variety) had the minimum values of dry mater and LAI. Couple hybrid varieties of Sk2025H and Sk2058H didn't induce any increment in their dry matte and LAI over Giza 178 that might prove their sensitive for saline stress. Sakha 104 had the tallest plant. Giza 177 gave shortest plants and

period to heading, while Sk2025H gave the longest period to heading. The tallest plant produced by Sakha 104 followed by Sk2025H. Among hybrid varieties, Sk2058H showed the shortest period to heading. High seedling vigor and good growth with optimum dry matter and LAI are associated with salt tolerance and higher grain yield of any hybrid or inbred variety under saline soil .Similar data have been reported by Yang *et al* .(1999), Chandrasekhar *et al.* (2001), Singh. (2002), Zayed. (2002),Gautam. (2004) and Zayed *et al* . (2005a).

Nitrogen treatments significantly influenced the growth dry matter, LAI and plant height of rice in the study seasons (Table 1). The measured growth parameters significantly responded to nitrogen up to 240 kg/ha and there was progressive improvements on growth of rice. This could owing to low available N status of the soil and ion imbalance under saline soil. Furthermore, nitrogen application could ameliorate the undesirable effect of salts where, it encourages extensive root growth, large leaf area , more dry matter production and considerable net photosynthesis. It was observed that increasing nitrogen level up to 240 kg N/ ha significantly retarded heading. As seen in Table 1 non of nitrogen application shortened heading date, under salt stress. Zayed *et al.*(2005b) claimed that both low nitrogen availability and salt stress accelerate the heading and shortened the vegetative period and consequently led to less dry mater production at pre-heading and resulted in low grain yield .

Table (1): Dry matter g/m^2, leaf area index (LAI), heading date and plant height cm of some hybrid and inbred rice varieties as affected by nitrogen levels under saline soil.

Traits	Dry matter g/ m^2		LAI		Heading date		Plant height	
Treatments	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
Varieties								
Sk 2034H	1302	1306	5.12	5.16	97.8	98.2	107.4	105.9
Sk 2025H	1147	1135	4.12	4.48	100.0	99.4	103.9	105.1
Sk 2058H	1093	1102	4.42	4.66	92.0	92.7	111.9	106.5
Giza177	745	733	3.46	3.72	90.6	91.4	93.5	98.7
Giza 178	1217	1205	4.77	4.74	95.4	96.4	97.9	102.9
Sakha104	1138	1122	3.78	4.07	98.0	98.8	114.4	108.9
$LSD_{0.05}$	39.0	44.2	0.23	0.22	1.4	0.83	3.4	3.1
N.levels (kg/ha)								
0	883	820	2.97	3.17	93.4	92.8	94.4	96.8
60	1051	1008	3.53	3.64	94.7	93.9	99.2	101.1
120	1138	1127	4.13	4.38	95.6	95.9	104.5	105.9
180	1208	1237	5.11	5.21	97.5	97.5	108.7	108.8
240	1256	1311	5.66	5.99	99.4	99.4	117.8	110.7
$LSD_{0.05}$	30	25.	0.13	0.12	0.4	0.4	1.4	1.1
Interaction	**	**	**	**	NS	NS	NS	NS

The current results are in a good harmony with those cited by Yadav *et al.*(2002) , Meena *et al.*(2003) Gautam .(2004) and Zayed *et al.*(2005b).

Considering the interaction effect, the interaction between the evaluated rice varieties (hybrid /inbred) and nitrogen levels had significant

effects on dry matter and LAI in both season (Table 2). The best combination was SK2034H and higher nitrogen level of 240 kg N/ ha in which they gave the maximum values of dry matter and LAI in both seasons . It was recognized that most cultivars significantly responded to nitrogen application up to 180 kg N/ha regarding their dry matter production particularly the hybrids ,Sk2058H ,Sk2025H ,and inbred ones, Giza 178 and Sakha 104 .The combination of Giza 177 and zero nitrogen addition was the worst and produced the lowest values of dry matter and LAI .Interestingly , Giza 177 significantly responded to nitrogen application up to 240 kg N/ ha indicating that increasing nitrogen fertilizer might be enhancing salinity withstanding .Similar findings have been reported by Subbiah *et al.* (2001).

Yield attributing traits

Table (2): Dry matter, LAI and filled grains /panicle as influenced by the interaction between rice varieties and nitrogen levels during 2005 and 2006

Varieties	N levels (kg/ha)	dry matter g/ m^2		LAI		Filled grains	
		2005	2006	2005	2006	2005	2006
Sk 2034H	0	1026.3	1038.3	3.18	3.29	109.0	105.8
	60	1217.0	1227.0	3.95	3.85	128.7	129.8
	120	1326.3	1337.0	4.88	5.03	135.7	138.0
	180	1422.0	1437.0	6.51	6.74	146.5	148.0
	240	1522.0	1492.8	7.06	6.91	142.5	147.0
Sk 2025H	0	883.80	846.30	3.02	3.22	101.0	101.0
	60	1072.0	1012.8	3.48	3.62	120.0	110.5
	120	1186.3	1141.0	4.17	4.51	133.0	119.0
	180	1274.0	1313.3	4.65	5.26	142.5	144.0
	240	1321.0	1359.3	5.26	5.81	138.7	139.8
Sk 2058H	0	887.5	720.0	3.26	3.43	96.0	91.50
	60	1037.0	973.0	3.68	3.81	114.3	111.5
	120	1112.2	1137.3	4.15	4.26	131.0	124.0
	180	1208.0	1293.0	5.30	5.29	139.0	134.0
	240	1223.0	1387.0	5.79	6.53	145.5	144.0
Giza177	0	553.75	523.50	2.43	2.61	73..0	68.8
	60	686.30	665.8	2.92	3.14	88.0	79.5
	120	743.8	746.50	3.30	3.71	99.0	94.0
	180	806.0	817.8	4.01	4.18	114.0	111.3
	240	940.0	911.50	4.64	4.97	127.7	128.0
Giza178	0	987.5	892.30	3.22	3.57	105.0	105.3
	60	1168.8	1140.3	3.84	3.99	116.1	119.5
	120	1262.5	1274.3	4.55	4.63	127.0	129.0
	180	1341.0	1335.0	5.90	5.10	143.2	145.0
	240	1328.0	1384.0	6.38	6.43	134.0	145.0
Sakha104	0	971.0	900.0	2.72	2.87	99.7	97.3
	60	1125.0	1028.0	3.32	3.42	111.0	111.8
	120	1200.3	1126.0	3.75	4.10	120.7	122.3
	180	1201.3	1228.0	4.28	4.69	131.0	129.8
	240	1205.0	1331.8	4.83	5.28	134.0	135.5
LSD0.05		73.8	62.3	0.32	0.29	12.7	11.0

Data documented in Tables 3 & 4 clarify that the various tested varieties greatly varied in their yield attributing traits; panicle numbers, panicle length, number of filled and unfilled grains/panicle, panicle weight and 1000–grain weight in both seasons. The hybrid variety Sk2034H showed its superiority over other hybrid and inbred ones in panicle numbers, number of filled grains and panicle weight. In addition, Sk2034H recorded the lowest values of unfilled grains that prove its relevance to saline soil because the salts mainly affected the grain filling and fertility . The longest panicle was produced by Giza 178 in the first season and Sk2025H in the second season and they were at a par in their panicle length . Coming to the 1000- grain weight ,Sakha104 exerted the heaviest 1000-grain weight while the lightest 1000-grain weight produced by Giza 178. Couple rice varieties of Sk2034H and Giza 178 were at the same level of significance in their 1000–grain weight in both seasons (Table 4) .The values of unfilled grains /panicle recorded by SK2058H followed by Giza 177. As seen here, the hybrid Sk2034H confirmed its superiority in early growth resulting in high dry matter and LAI ,which led to great improving in the main yield component s,. i. e. panicle number ,filled grains/ panicle and panicle weight resulted in high grain yield. The varietal differences were observed among the elite hybrid and inbred rices in their yield attributing traits by several researchers, among then Niu *et al.* (2001) ,Bhanumathy *et al* .(2003) Patil *et al* .(2003) ,Gautam .(2004) and abou khalifa .(2005) .

Table (3):Panicle numbers /hill, panicle length cm ,filled grains /panicle and unfilled grains /panicle of some hybrid and inbred rice varieties as affected by nitrogen levels under saline soil during 2005 and 2006 seasons

Traits	Panicle No./ hill		Panicle length		Filled grains /panicle		Unfilled grains/ panicle.	
Treatments	2005	2006	2005	2006	2005	2006	2005	2006
Varieties								
Sk 2034H	16.99	16.27	22.12	22.43	132.70	134.30	17.36	17.21
Sk 2025H	14.40	13.88	21.50	21.39	126.85	128.86	29.70	21.52
Sk 2058H	13.84	13.49	21.38	21.33	123.55	121.00	35.46	38.60
Giza177	10.63	11.37	19.71	19.52	100.56	96.31	24.30	22.43
Giza 178	15.28	14.62	22.85	21.74	124.70	128.80	22.90	18.60
Sakha104	15.00	14.16	22.52	21.04	119.20	119.32	19.92	18.16
$LSD_{0.05}$	1.68	0.84	1.03	0.54	8.25	5.00	3.09	5.10
N. levels (kg/ha)								
0	10.80	10.70	19.20	19.33	97.3	95.42	37.13	31.00
60	13.11	12.57	20.95	20.45	113.00	110.08	30.39	23.00
120	14.80	13.95	22.08	21.27	123.75	121.58	23.33	19.00
180	16.50	15.58	22.89	22.19	136.00	135.46	15.83	17.58
240	17.30	17.04	23.28	22.81	137.00	139.88	23.27	21.33
$LSD_{0.05}$	0.61	0..963	0.34	0.22	3.50	5.20	2.71	4.51
Interaction	NS	**	NS	NS	**	**	NS	NS

Regarding nitrogen levels impact, nitrogen fertilizer treatments had significant and positive impact on yield attributes in both seasons (Tables 3 &4). Increasing nitrogen level up to 240 kg N/ha significantly increased panicle numbers/ hill, panicle length and weight and 1000 grain weight

season in 2006, while up to 180 kg/ ha for number of filled grains/panicle. However, increasing nitrogen rates up to 180 kg/ha pronounced reduced number of filled grains /panicle, but the higher nitrogen rate of 240 kg N/ha failed to decrease number of unfilled grains/ panicle .Couple nitrogen rates of 60 and 240 kg N/ha were comparable in unfilled grain numbers. The treatment of zero nitrogen application recoded the lowest values of yield attributes, except unfilled grains where it gave the maximum value of it. The obtained improvement in yield attribute as a result of increasing nitrogen fertilizer might be due to the increased accumulation of photosynthesis from source to sink and during grain filling as well as delaying leaf senescence under salt stress. That might be due to stimulate the vigorous growth superficial roots, increased the synthesis of cytokinins (mainly Zeatian) in roots, and delayed the appearance of the absesic acid (ABA) peak in both leaves and filling grains .High ratio of Zeatian /ABA enhanced the synthesis of RNA ,which resulted in protein synthesis for carbon assimilation and transportation (Yang and Sun., 1992) .The present findings are in good accordance with the results of Balasubramanian.(2002), Singh. (2002), Meena *et al.* (2003) ,Shivay and Singh .(2003), Gautam. (2004) and Zayed *et al* .(2005b).

Table (4): Panicle weight (g),1000 grain weight (g), grain yield t/ha and straw yield t /ha of some inbred and hybrid rice varieties as affected by nitrogen levels during 2005 and 2006 seasons .

Traits	Panicle weight(g)		1000-grian wt(g)		grain yield t/ ha		Straw yield t/ ha	
Treatments	2005	2006	2005	2006	2005	2006	2005	2006
Varieties								
Sk 2034H	3.92	3.96	21.73	20.76	6.52	6.71	7.99	8.15
Sk 2025H	3.47	3.37	22.49	21.62	5.08	5.42	6.14	6.44
Sk 2058H	3.45	3.18	23.78	23.48	4.69	5.29	6.65	7.03
Giza177	2.96	2.29	25.18	25.16	3.85	4.08	4.57	4.91
Giza 178	3.51	3.38	21.14	20.75	5.64	6.03	6.96	7.39
Sakha104	3.40	3.19	27.30	25.90	5.42	5.69	6.26	6.59
$LSD_{0.05}$	0.34	0.18	0.91	0.33	0.49	0.46	0.45	0.39
N. levels kg/ha								
0	2.48	2.15	22.05	21.29	3.58	3.82	4.974	5.24
60	3.16	2.66	22.81	21.99	4.66	4.94	5.720	5.99
120	3.66	3.25	23.47	22.95	5.34	5.61	5.65	6.73
180	3.96	3.84	24.55	23.77	6.13	6.46	6.39	7.79
240	4.10	4.25	24.57	24.64	6.38	6.71	7.43	8.07
$LSD_{0.05}$	0.15	0.15	0.54	0.19	0.16	0.14	0.16	0.15
Interaction	NS	**	**	**	**	**	NS	NS

The interaction between rice varieties and nitrogen levels had a significant effect on panicle numbers /hill in 2006 season (Table 5) .The combination of Sk2034H and higher nitrogen level of 240 kg N /ha gave the maximum values of panicle numbers /hill without any significant differences with those produced by the same variety under nitrogen rate of 180 kg ha^{-1} . The lowest values of panicle numbers hill $^{-1}$was obtained when Giza 177 was grown without nitrogen application .

Table (5): Panicle numbers/ hill of rice as affected by the interaction between rice varieties and nitrogen levels during 2006 season

Varieties	Nitrogen levels				
	0	60	120	180	240
Sk 2034H	12.25	15.30	16.23	18.40	19.18
Sk 2025H	11.13	12.6	13.70	15.35	16.63
Sk 2058H	10.53	11.83	12.88	15.50	16.73
Giza177	7.23	9.50	11.83	13.28	15.03
Giza178	12.03	13.38	14.58	15.67	17.48
Sakha104	11.01	12.80	14.51	15.27	17.21
$LSD_{0.05}$	0.97				

The interaction between rice varieties and nitrogen levels had a significant effect on panicle weight in 2006 season (Table 6). The heaviest panicle weight was produced by Sk2034H when it received 180kg N/ ha with out any significant differences with those of Sk2025H under the nitrogen level of 240 kg N/ ha. The panicle weight of Sk2034H recoded marked reduction under the higher nitrogen level of 240 kg N /ha. The lightest panicle weight was obtained by the combination of Giza 177 and zero nitrogen application. Thereby, The nitrogen level of 180 kg N/ ha was found to be efficient to improve the panicle weight of both rice varieties Sk2034H (the best hybrid) and Giza 178 (High yielding inbred variety and salt tolerant one). Meanwhile, the rest varieties need to increase nitrogen level up to 240 kg N/ha for improving their panicle weight. The interaction between nitrogen levels and rice varieties had a significant effect on 1000- grain weight in both seasons (Table 7). The heaviest 1000- grain weight was produced by Sakha 104 when fertilized by 180and 240 kg N/ha in 2005 and 2006 seasons ,respectively.

The combination of Giza 178 and Zero nitrogen level gave the lightest 1000- grain weight without significant differences with those obtained by Sk2034H under non nitrogen application .Subbiah *et al.* (2001) came to similar findings .

Table (6): Panicle weight (g) of rice as affected by the interaction between rice varieties and nitrogen levels during 2006 season

Varieties	Nitrogen levels				
	0	60	120	180	240
Sk 2034H	2.71	3.50	4.03	4.83	4.75
Sk 2025H	2.38	2.85	3.29	3.92	4.40
Sk 2058H	2.07	2.59	3.05	3.56	4.65
Giza177	1.35	1.84	2.37	2.76	3.17
Giza178	2.30	2.85	3.51	4.06	4.18
Sakha104	2.07	2.34	3.28	3.92	4.34
$LSD_{0.05}$	0.35				

Table (7): One thousand grain weight (g), grain yield (t /ha) and N uptake (kg/ha) of rice as affected by the interaction between rice varieties and nitrogen levels during 2005 and 2006 seasons

Varieties	N. level kg/ha	1000- grain wt(g)		Grain yield t /ha		N Uptake	
		2005	2006	2005	2006	2005	2006
Sk 2034H	0	19.83	19.36	4.53	4.48	65.61	66.74
	60	20.71	20.03	5.68	6.08	89.07	88.15
	120	21.56	20.58	6.33	6.71	98.59	101.60
	180	22.57	21.60	7.97	8.13	115.24	118.20
	240	22.10	22.03	8.13	8.18	124.05	128.80
Sk 2025H	0	23.03	20.28	3.74	4.09	48.86	41.49
	60	21.63	20.63	4.89	5.13	68.73	61.77
	120	22.18	21.68	5.19	5.44	77.31	78.38
	180	22.93	22.45	5.80	6.21	81.03	89.76
	240	22.70	23.08	5.88	6.23	95.14	102.44
Sk 2028H	0	21.48	21.55	3.34	4.46	53.43	42.44
	60	22.84	21.93	4.20	4.73	73.15	62.40
	120	23.93	22.83	4.83	5.39	81.78	71.87
	180	24.78	21.23	5.41	5.73	90.75	87.30
	240	25.40	26.88	5.66	6.16	101.25	96.98
Giza177	0	22.70	23.48	2.17	2.44	32.35	28.11
	60	24.33	24.65	3.17	3.36	48.60	40.81
	120	25.64	25.60	3.97	4.14	59.90	53.20
	180	26.53	25.83	4.70	4.83	72.59	64.30
	240	27.20	26.00	5.26	5.66	84.06	75.30
Giza178	0	19.63	19.23	4.22	4.39	54.35	38.33
	60	20.33	19.96	5.29	5.42	72.80	73.10
	120	21.48	20.69	6.08	6.18	85.66	86.50
	180	22.21	21.73	6.81	7.18	101.25	94.90
	240	22.08	22.18	6.51	6.91	114.72	101.42
Sakha104	0	25.63	24.00	3.47	3.79	48.27	50.41
	60	27.06	24.75	4.76	5.01	67.47	63.88
	120	27.60	26.30	5.64	5.85	76.47	75.30
	180	28.30	26.81	6.39	6.66	88.73	85.30
	240	27.93	27.64	6.83	7.15	97.70	95.74
LSD0.05		1.39	0.50	0.40	0.34	3.85	4.38

Yield:

Regarding performance of rice varieties under saline soil, the tested rice varieties considerably varied in their grain and straw yields in both seasons (Table 4). It was observed that Sk2034H recorded higher heterosis in the grain yield in the years of study over others involving hybrid and inbred rice varieties .That was also fact with those of straw in both seasons .Based on the current finding Sk2034H hybrid variety confirm it salinity tolerance more than Giza178 and Sakha104 (salt tolerant Egyptian varieties). Giza 177 proved its inferiority under saline soil in this study whereas, it gave the lowest values of grain and straw yields .Giza 178 and Sakha 104 rice varieties were comparable in their performance under such condition considering the grain yield. Also, couple hybrid varieties (Sk2025H and SK2058H) were at par in this issue and they didn't achieve any yield increase over the best commercial varieties, Giaz178 and Sakha 104 .As previously detected Sk2034H showed better growth and optimum main yield components led to higher grain yield. Yang *et al* . (1999), Kumar *et al* . (2002), Singh .(2002), Zayed .(2002), Bhanumathy *et al.* (2003), Gautam. (2004) and Abou Khalifa. (2005) have reported similar findings .

There was a significant increase in grain yield of rice with increase in nitrogen levels (Table 4). The response of grain yield to nitrogen was linear up to 240 kg N/ ha significantly higher grain yield at the highest level of nitrogen was obtained ,might be owing to better N uptake leading to greater dry matter production and its translocation to the sink .Increased panicle numbers /hill ,panicle length ,filled grains /panicle and grain weight were mainly responsible for the increased yield at this level of nitrogen.

Also , the observable linear increasing of grain yield with increasing nitrogen level up to the higher level of 240kg N /ha might be attributes to the low nitrogen availability happened by ion imbalance and uptake under saline conditions. The straw yield also significantly increased with increasing level of nitrogen during both years .Vigorous growth (plant height) with the increase in nitrogen level resulted higher straw yield . These findings confirm the results of yadav *et al* . (2002), Singh *et al* .(2002) ,Meena *et al* . (2003) , Shivey and Singh. (2003) , Gautam. (2004) and Zayed *et al* .(2005b)

The interaction between rice varieties (inbred /hybrids) and nitrogen levels had a significant effect on grain yield in both seasons. The highest grain yield was obtained by Sk2034H hybrid variety when it fertilized by nitrogen level of 240 kg N/ha without any significant differences with those produced by the same hybrid under 180 kg N /ha. The rest hybrids showed the same trend .Giza 177 and Sakha 104 significantly responded to nitrogen up to 240 kg N/ha that could be recommended for them under saline soil. Interestingly, Giza 178 gave its maximum grain yield when received 180 kg N/ha and their grain yield insignificantly decreased at 240kg N / ha. Subbiah *et al* . (2001) also reported similar results .

Table (8): N uptake (kg N /ha), nitrogen use efficiency (NUE) kg rice /kg N ,apparent recovery (%) and physiological efficiency index of absorbed nitrogen (PEIN) of some inbred and hybrid rice varieties as affected by nitrogen levels during 2005 & 2006

Traits	N uptake kg /ha		NUE		apparent recovery %		PEIN	
Treatments	2005	2006	2005	2006	2005	2006	2005	2006
Varieties								
Sk 2034H	98.51	100.70	17.31	19.65	29.82	29.60	64.69	66.24
Sk 2025H	74.21	74.77	12.56	13.22	24.19	29.28	71.00	74.30
Sk 2058H	80.10	72.19	11.55	11.95	23.95	26.14	66.76	70.43
Giza177	59.50	52.34	14.56	14.05	22.66	20.01	75.62	79.56
Giza178	85.96	78.85	13.82	14.94	26.85	21.40	70.66	73.38
Sakha104	75.67	74.13	16.28	17.10	25.19	20.16	73.68	77.11
$LSD_{0.05}$	5.95	2.95	2.82	2.80	4.46	3.15	NS	6.39
N. levels kg/ha								
0	50.49	47.92					76.51	80.86
60	69.95	65.01	17.19	18.81	32.06	28.37	73.02	75.82
120	79.89	77.79	14.29	14.89	24.74	24.99	69.38	72.26
180	92.60	89.09	14.35	14.74	23.36	23.08	68.87	71.61
240	102.82	100.09	11.35	12.18	21.63	21.29	64.00	67.17
$LSD_{0.05}$	1.52	1.79	1.25	1.23	1.38	1.19	4.14	3.28
Interaction	**	**	NS	NS	NS	NS	NS	NS

N Uptake and nitrogen use efficiencies

The tested rice varieties, (inbred/hybrids) significantly varied in their N uptake, nitrogen use efficiency (NUE), apparent recovery %, and physiological efficiency index of absorbed nitrogen (PIEN) in the two seasons, except PIEN in the first season (Table 8). Sk2034H gave the highest values of N uptake followed by Giza 178 while the lowest value of it was produced by Giza 177. Also, Sk2034H gave the maximum value of NUE without significant differences with those produced by Sakha104 in the years of study. On the other side , the lowest value of NUE was exerted by Sk2058H. Sk2034H recorded the highest value of apparent recovery % without any significant differences with those given by Giza 178 in the first season and SK2025H in the second season while the lowest value of apparent recovery % was recorded by Giza 177 in both years. On contrary, Giza 177 recorded the highest value of PEIN, while SK2034H recorded the minimum value of it. Thereby, it is hypothesized that the higher nitrogen uptake and efficiency in the best hybrid rice resulted from higher root absorption potential, greater capacity, and more efficient translocation of N and their positive interactions (Yang *et al.*, 1999, Meena *et al* .,2003 and Shivay and Singh .,2003) .

Coming to nitrogen fertilizer treatments, the total uptake of nitrogen by rice plants significantly increased with increasing nitrogen rate up to 240 kg N/ ha owing to production of higher amount of biomass. The highest nitrogen level recorded the maximum N uptake and significantly higher than the other levels of N (Table 8). However, nitrogen levels had significant effect on NUE ,apparent N recovery % and PEIN (Table 8). Agronomic NUE ,apparent N recovery % and PEIN significantly declined as N applied to rice owing to higher N losses due to subjecting to leaching and denitrification losses . The lowest values of all above mentioned traits were produced by adding the highest nitrogen level (240 kg /ha). Similar findings have been reported by Shivay and Singh.(2003) .

The interaction between rice varieties (inbred /hybrids) and nitrogen levels had significant effect on N uptake in the both years of study (Table 7). Sk2034H gave the highest values of N uptake when it received the higher nitrogen level (240 kg N/ ha). On the other hand, Giza 177 recorded the minimum value of N uptake when it received Zero N level . Dubey and Bisen .(1989) reported significantly interaction of nitrogen levels and rice varieties for total nitrogen uptake .

Form going discussion Sk2034H hybrid rice variety could be recommended for saline soil or saline water and poor quality irrigation water with nitrogen level of 180 kg ha^{-1} .In this issue Giza 178 occupied the second order with 180 kg N /ha. The other two hybrids are not recommended under such conditions and Giza 177 is too.

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استجابة بعض أصناف الأرز الهجين والأرز العادي لمعدلات مختلفة من النتروجين تحت ظروف الأراضي الملحية .

بسيوني عبد الرازق زايد [1] ، أحمد محمد محمد الاختيار [1] ، عبد المعطي بسيوني العبد [1] و محسن عبد العزيز بدوي [2]

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أقيمت تجربتان حقليتان بمحطة بحوث السرو الزراعية ،دمياط وذلك خلال موسمي ٢٠٠٥و٢٠٠٦ وذلك لدراسة استجابة بعض أصناف الأرز الهجين والأرز العادي وهي Sk2034H و Sk2025H و Sk2058H والأصناف، جيزة ١٧٧وجيزة١٧٨وسخا١٠٤ لمعدلات التسميد ا لنتروجيني (صفر ،٦٠،١٢٠و. ١٨٠و٢٤٠ كجم هكتار$^{-1}$) أرض التجربة كانت طينية ومستوى الملوحة كان ٧,٨٩ و ٨, ٢٥ ملليموز سم$^{-1}$.وتم قياس صفات النمو:المادة الجافة ودليل مساحة الورقة وموعد الطرد وطول النبات والمحصول(قش وحبوب) والصفات المساهمة في تكوينية(عدد السنابل طول السنبلة عدد الحبوب الممتلئة والفارغة وزن السنبلة ووزن الألف حبة) ومعدل امتصاص النتروجين وبعض قياسات كفاءة النتروجين مثل كفاءة استخدام النتروجين ونسبة معالجة النتروجين الظاهرة ودليل الكفاءة الفسيولوجية للنتروجين الممتص.

أختلفت الأصناف معنويا في جميع الصفات المدروسة .كان أفضل الأصناف هو الصنف الهجين Sk2034H و احتل الصنف جيزة١٧٨ المركز الثاني من حيث الأفضلية تحت ظروف الأرض ا لملحية ثم سخا ١٠٤ .جاء الصنف جيزة ١٧٧ في المركز الأخير .

أدي زيادة معدلات النتروجين حتي المعدل ٢٤٠ كجم هكتار$^{-1}$ إلي زيادة معنوية في النمو والمحصول وجميع الصفات المساهمة في تكوينه ومعدل امتصاص النتروجين . أما قياسات كفاءة النتروجين فقد قلت بزيادة معدلات النتروجين.

كان التفاعل معنويا علي بعض صفات النمو ومكونات المحصول ومحصول الحبوب ومعدل امتصاص النتروجين. من دراسة التفاعل وجد أن المعدل النتروجين الأمثل لأصناف الأ رز الهجين هو ١٨٠ كجم هكتار$^{-1}$ وكذلك الصنف جيزة ١٧٨ أما الصنف جيزة ١٧٧ وسخا ١٠٤ كان ٢٤٠ كجم نتروجين هكتار$^{-1}$.