Egypt. J. Agric. Res., 77 (2), 1997

PERFORMANCE OF SOME RICE VARIETIES AS INFLUENCED BY DIFFERENT NITROGEN LEVELS UNDER SALT AFFECTED SOIL

A.A.M. ABDEL-RAHMAN

Rice Research and Training Center, Sakha, Kafr El-Sheikh, Egypt .

(Manuscript received 9 September 1997)

Abstract

Two field experiments were conducted under salt affected soil at El-Sirw Agricultural Research Station Farm, Damietta, Egypt, during 1995 and 1996 growing seasons through Rice Salinity Program to study the performance of three rice varieties, Sakha 101, Sakha102 and Giza 178, as affected by four nitrogen levels; 0.50, 100 and 150 Kg N/ha. The ECe and the pH of the experimental site were 9.7 ds/m2 and 8, respectively.

The main results of the investigation could be summarized as follows:

- Giza 178 produced the highest panicle length, number of filled grains/ panicle numer of panicles/m2 as well as grain and straw yields, while Sakha 102 produced the tallest plants, the heaviest 1000-grain, the shortest panicle, and the lowest number of filled grains/panicle, number of panicles/m2, panicle weight as well as grain and straw yields. Sakha 101 produced the highest panicle weight..
- Increasing nitrogen levels from 0 to 150 kg N/ha resulted in a continuous in plant height, panicle length, number of filled grains/panicle, number of filled grains/panicle, number of panicles/m2, panicle weight, 1000-grain weight, as well as grain and straw yields.
- The interaction between varieties and levels of applied Nitrogen had a significant effect on number of filled grains/panicle, pancile weight, 1000-grain weight as well as grain and straw yields.

INTRODUCTION

Soil salinity is a major problem in many rice producing areas of the world. In coastal and northern parts of the Delta in Egypt, it is common practice to plant rice as a reclamation crop in salt affected soils which are irrigated with water of variable quality and lack adequate drainage facilities. Poor quality water and inadequate drainage facilities contribute largely to the salinity problem in rice paddies. Suppression of plant growth under saline conditions may either be due to osmotic pressure reduction in nutrient availability or to specific ion effect.

Rice varieties with improved salt tolerant planted in salt-affected area is of great significance to increase the level of production. Rice is considered as a very sensitive (De Datta, 1972) to moderately sensitive (Maas and Hoffman, 1977) crop to salinity. Rice varieties differ significantly in grain yield and its attributes under salt affected areas (Abd El-Rahman et al., 1988). Rahman (1985) investigated the behavior of four rice varieties (IR 747, P3C26, Zhulian and PP6R at three N levels (0, 2 and 4 g $(NH_4)_2$ So_4/pot). The data showed that the application of N significantly increased grain yield and plant height. Yield increase in IR 747 and P3C26 varieties was due to the increased number of grains/panicle, while in the other two varieties it was due to grain size. Abd El-Rahman et al. (1986) reported that the grain yield and number of grains/panicle, while in the other two varieties it was due to grain size. Abd El-Rahman et al. (1986) reported that the grain yield and number of panicles/m2responded to N up to 96 kg/ha, while the straw yield responded up to 144 kg N/ha, but panicle weight and 1000-grain weight responded only to 48 kg N/ha. De Datta et al (1987) reported that increasing N level increased plant height, panicle number, panicle lenght and panicle weight. Singh et al. (1989) applied five N levels (0, 29, 58, 87 and 116 kg N/ha) in partially reclaimed saline soil and that the grain yield increased by increasing N level. Mandal et al, (1991) applied 0-200 kg N-ha. the data showed that plant height and grain yield increased with increasing the level of N up to 150 kg/ha, while number of panicles/m2 and straw yield increased with increasing the level of N up to 200 kg/ha. Sundar singh et al. (1995) studied the response of two rice varieties (CO37 and CO41) to water management and nit rogen level (75, 100 and 125 kg N/ha), and found that grain yield was higher in CO37 than CO41 and increased with increasing nitrogen rate. Abd El-Rahman et al. (1996) studied three spacing and four N levels (0.50, 100 and 150 kg N/ha) on two rice varieties (Giza 178 and GZ 1368) under saline soil conditions. They pointed out that Giza 178 out-yielded GZ 1368. Raising nitrogen fertilizer level up to the highest dose (150 kg N/ha) was associated with marked increases in all the studied traits, except panicle length for Giza 178.

The present investigation was directed mainly to study the response of three new released rice varieties to four levles of nitrogen under saline soil conditions.

MATERIALS AND METHODS

In two successive seasons. 1995 and 1996 two field experiments were conducted under salt affected soil at El-Sirw Agricultural Research Station Farm. Da-

mieetta, Egypt. The investigation was directed to study the response of three rice varieties, namely Giza 178, Sakha 101 and Sakha 102 to four levels nitrogen (0, 50, 100 and 150 kg N/ha). The experiments were laid out following split plot design with five replications. The rice varieties were randomly arranged in the main plots, while the sub plots received the nitrogen levels treatments. The plot size was 10 m2 (2.0 x 5.0 m). Soil chemical analysis of the experimental site revealed the following: ph=8, ECe=9.7 ds2/n, cation meq/L were : Na+=47, Ca^{++} + Mg^{++} = 31 and K = 0.34 and the anions meq/L were: CO_3 = 1.0, CL-=45 and SO_4--=31 and the content of N was (29 ppm). The previous crop was clover in both seasons. Nitrogen in the form of urea (46% N) was applied as per treatment in two equal doses, 1/2 at 20 days after transplanting and the rest at panicle initiation. The other cultural practices were conducted following the recommendations for transplanted rice.

At harvest, Plants of ten guarded hills were taken for estimating the following characters:

1. Plant height
2. Panicle length
3. Number of panicles/m2
4. Number of filled grains/panicle
5. 1000-grain weight
6. Panicle weight

The plants in the inner six square meters of each subplot were harvested, labeled and transported to the threshing floor for air drying. Five days later the plants were threshed and the grains weight was recorded and adjusted to 14% moisture content. Grain and straw yields were experessed in tons/hectare.

The data were subjected to statistical analysis of variance for each season and combined analysis was performed over seasons. The differences among averages of the studied traits were judged withs the least significant differences (LSD) at 5% level of significance (Gomes and Gomes, 1984).

RESULTS AND DISCUSSION

The combined analysis of variance for 1995 and 1996 seasons and means of rice grain yield and its major components showing the effects of rice varieties and nitrogen levels are show in Table 1. The effects of variety x nitrogen levels interaction are given in Table 2. The imprortant findings are as follows:

1. Varietal differences:

The three tested varieties significantly differed in plant height, panicle length, number of filled grains/panicle, number of panicle weight, 1000-grain weight, straw yield, as well as grain yield. Giza 178 produced the longest panicle (21.4 cm) and the highest number of filled grains/panicle (131.5) number of panicles/m2 (450), grain yield (6.55 t/ha) as well as straw yield (8.6 t/ha). Sakha 102 produced the tallest plants (98.3 cm), the heaviest 1000-grains (27.7 g), the shortest panicle (20.5 cm) and the lowest number of filled grains/panicle (105), number of panicles/m2 (395), panicle weight (2.9g), grain yield (5.9) and straw yield (7.6 t/ha). Sakha 101 was inferior in plant height and superior only in panicle weight (3.2 g). Differential performance for the tested varieties under salinity. Similar results were also reported by Rahman (1985), Abd El-Ramman et al., (1988) and Abd El-Rahman et al. (1996).

2. Nitrogen levels effects :

Highly significant differences were observed in the effect of nitrogen level on plant height, panicle length, number of panicles/m2, number of filled grains/panicle, panicle weight, 1000-grain weight, grain and straw yields (t/ha). It is clear that increasing nitrogen level from 0 to 150 kg N/ha was accompanied by continuous increase in plant height from 86.4 to 93.7 cm, panicle length from 19.4 to 22.3 m, number pf panicles/m2 from 332.5 to 470, number of filled grains/panicle from 103.3 to 128.3, panicle weight from 2.7 to 3.4g, 1000-grain weight from 24.0 to 26.3 g, straw yield from 6.8 to 8.8 t/ha and grain field from 5.0 to 6.9 t/ha. It is interesting to mention that the increase in nitrogen level from 0 to 50, 100 and 150 g N/ha resulted in grain yield increases of 1.3, 1.6 and 1.9 t/ha, representing 26, 32 and 38% over the un-fertilized plots. Singh et al. (1989), Mandel et al. (1991) and Abd El-Rahman et al. (1996) reported similar increases in grain yield and most of its attributes due to the increases in level of applied nitrogen.

Interaction of varieties X nitrogen levels effects:

Means of number of filled grains/panicle, panicle weight, 1000-grain weight (g), as well as grain and straw yields (t/ha) as influenced by varieties X N levels interaction are listed in Table (2).

Results in Table (2) show that when 150 kg N/ha was applied Giza 178 produced the highest number of filled grains/panicle, grain and straw yield (t/ha) while

Table 1. Rice grain yield and yield contributing characters averaged for three varieties and four nitrogen levels under saline soil conditions (Combined analysis of 1995 .

Main effects	Plant height/ cm	Panicle length/ cm	No. of panicle/ m2	No. of filled grain/ panicle	Panicle weight/ g	1000 Grain weight/g	Grain yield t/ha	% Increase over the low yield	Straw yield t/ha
Varieties:									
GZ 4596	82.4	21.2	400	115.2	3.2	27.2	6.14	4	8.1
GZ 5379	98.3	20.5	395	105.0	2.9	27.7	5.90	-	7.6
Giza 178	90.6	21.4	400	131.5	3.1	20.5	6.55	11	8.6
F test	**	*	**	**	*	**	**		**
LSD 0.05	0.6	0.22	7.25	1.25	0.07	0.68	0.06		0.23
N level (kg/ha):									
0	86.4	19.4	332.5	103.5	2.7	24.0	5.0	-	6.8
50	89.6	20.8	410.0	114.6	3.0	24.7	6.3	26	8.3
100	92.0	21.6	440.0	122.5	3.2	25.4	6.6	32	8.5
150	93.7	22.3	470.0	128.3	3.4	26.3	6.9	38	8.8
f test	**	**	**	**	**	**	**		**
LSD 0.05	0.73	0.28	11.75	1.3	0.05	0.23	0.08		0.24
Interaction	N.S.	N.S.	N.S.	**	*	**	**		**

Sakha 101 produced the heaviest panicles and Sakha 102 produced the highest 1000-grain weight. But when no nitrogen was applied, Sakha 102 produced the lowest number of filled grains/panicle, panicle weight, grain and straw yields (t/ha), and Giza 178 produced the lowest 1000-grain weight. Similar results of differential varietal response to nitrogenous fertilization level were also observed by Mandal et al. (1991); Sundar Singh et al. (1995) and Abd El-Rahman et al. (1996).

It is interesting to mention while presenting the previous data that Giza 178 produced the highest grain yield when any of the tested nitrogenous fertilizer level was applied. The differential varietal response to nitrogenous fertilization may be due to the differences in genetical mak up of the tested varieties. In addition the application of 150 Kg N/ha could be recommended under saline soil condition when the new released rice varieties were introduced.

Table 2. Rice grain yield and attributes affected by varieties X N levels interaction under salt affected conditions (combined analysis of 1995 and 1996 seasons)

Main effects		No. filled grains/panicle	Panicle weight g	1000 grain weight g	Grain yield T/ha	Straw yield T/ha
Varieties	N level (%)					
GZ 5379	0	90	2.5	27.0	4.84	6.66
	50	102	2.9	27.4	6.10	7.70
	100	111	3.1	27.8	6.22	8.04
	150	117	3.2	28.6	6.34	8.10
GZ 4596	0	105	2.9	26.0	5.10	6.80
	50	113	3.0	26.8	6.22	8.23
	100	120	3.4	28.2	6.46	8.48
	150	123	3.5	27.2	6.78	8.88
Giza 178	0	116	2.7	19.0	5.08	6.98
	50	129	3.1	20.0	6.60	8.85
	100	136	3.2	20.8	7.06	8.96
	150	144	3.3	22.0	7.44	9.41
LSD 0.05		1.3	0.06	0.5	0.07	0.24

REFERENCES

1. Abd El-Rahman, A.A.M., I.R. Aidy and M.M.H. El-nahal. 1986. Productivity of rice as influenced by different planting spaces and nitrogen levels. Proc. 2nd Conf. Agron. Alexandria, Egypt. Vol. 1: 47-60.

2. Abd El-Rahman, A.A. M.; A.T. Badawi and A.E. Draz. 1988. Productivity of some rice varieties as influenced by different seedling ages under saline soil condition. Proc. 3rd Conf. Agron. Kafr El-Sheikh, Egypt, 5-7 Sept. Vol. 2: 109-117.

3. Abd El-Rahman, A.A.M.; Ghonema and A.A. Leilah. 1996. Yield and its attributes of two rice varieties as influenced by hill spaces and nitrogen levels under saline soil condition. Proc. 7th Conf. Agron. Mansoura, Egypt. Vol. 1: 113-120.

4. De Datta, S.K. 1972. A study for salt tolerance of twelve varieties of rice. Current Science. 41: 456-457.

5. De Datta, S.K.; W.N. Obcemea; R.Y. Chen; J.C. Calabio and R.C. Evangelista. 1987. Effect of water depth on nitrogen use efficiency and nitrogen-15 balance in lowland rice. Agronomy Journal, Vol. 79 No. 2. pp. 210-216.

6. Gomes, K.A. and A.A. Gomes. 1984. Statistical procedures for agricultural research. 2nd Ed. pp. 680. John Wiley and Sons, New York, USA.

7. Mandal, N.N.; Puste, A.M.; Choudry, P.P. and Singh, D. 1991. Effect of water regimes levels and methods of nitrogen application on growth and yield of rice. Environment and Ecology. 9: 3, 690-693.

8. Mass, E.V. and G.J. Hoffman. 1977. Crop salt tolorance - current assessment. J. Irrig. Drainage Div. ASCE. 103: 115-134.

9. Rahman, M.S. 1985. The relation between some growth parameters and yield component of rice as influenced by nitrogen level and genotype. Annals of Applied Biology. 107 (2): 325-333.

10. Singh, B., O.P. Srivastava, and H.G. Singh. 1989. Efficiency of modified nitrogen fertilizers in rice on partially reclaimed saline soil. IRRN. 14: 1, February.

11. Sundar Singh, S.D., A., Palchamy, A., Rajgopal, and S. Raniah. 1995. Water management and nitrogen levels on rice varieties under direct sown condition. Madras Agricultural Journal. 82 (2): 105-108.

تأثير مستويات مختلفة من الأزوت علي سلوك بعض أصناف الأرز تحت ظروف الأراضي المتأثرة بالملوحة

أحمد أحمد محمد عبد الرحمن

مركز البحوث والتدريب فى الأرز - سخا - كفر الشيخ - مصر.

أجريت تجربتان حقليتان تحت ظروف الأراضى المتأثرة بالملوحة بمزرعة محطة البحوث الزراعية بالسرو محافظة دمياط خلال موسمى ١٩٩٥ - ١٩٩٦ لدراسة مدي تأثير سلوك أصناف من الأرز جيزة ١٧٨، سخا ١٠١ ، سخا ١٠٢ بمستوي التسميد الأزوتي (صفر ، ٥٠ ٪ ، ١٠٠ ٪ ، ١٥٠ ٪، كجم ن/هكتار) حيث كانت درجة التوصيل الكهربائي ECe= 9.7 ds/m2 ودرجة حموضة pH = 8 .

ويمكن تلخيص نتائج هذه الدراسة على النحو التالى:

- تفوق الصنف جيزة ١٧٨ في طول الدالية، عدد الحبوب الممتلئة / دالية، عدد الداليات/م٢ ومحصول الحبوب والقش ... في حين تفوق الصنف سخا ١٠٢ في طول النباتات ووزن ألف حبة، بينما كان أقل في طول الدالية وعدد الحبوب الممتلئة/دالية وعدد الداليات/م٢، ووزن الدالية كما كان أقل الأصناف في محصول الحبوب والقش، أما الصنف سخا ١٠١ فقد أعطي أعلي وزن دالية.

- زيادة مستوى الأزوت من صفر إلي ١٥٠ كجم ن/هكتار أدي إلي زيادة مستمرة في قيم كل من طول النبات، طول الدالية، عدد الحبوب الممتلئة/دالية، عدد الداليات، وزن الدالية ووزن الالف حبة وكذلك محصول الحبوب والقش.

- ظهر تفاعل معنوى بين الأصناف ومستوياالتسميد الأزوتي بالنسبة لعدد الحبوب الممتلئة/دالية ووزن الالف حبة ومحصولي الحبوب والقش.