PRODUCTIVITY OF SOME RICE VARIETIES AS INFELUENCED BY DIFFERENT CONCENTRATIONS OF FOLIAR SPRAY OF UREA UNDER SALINE SOIL CONDITIONS

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Abstract

Two field experiments were conducted in 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, Giza 178, Sakha 101 and Sakha 102 as under five concentration of foliar sprayed urea viz., 0, 5%, 10%, 15% and 20%. The ECe and the pH of the experimental site were 9.7 ds/m2 and 8, respectively.

The main results could be summarized as follows:

- Giza 178 produced the highest number of panicles/m2, number of filled grains/panicle and grain and straw yields, while Sakha 102 was lowest for these traits plus panicle weight.
- Increasing the concentration of foliar applied urea from 0-20% resulted in a continuous increase in plant height, panicle length, number of panicles/m2, number of filled grains/panicle, 1000-grain weight, panicle weight and straw yields.
- The interaction between varieties and levels of foliar N had a significant effect on number of filled grains/panicle as well as grain and straw yields.

INTRODUCTION

Soil salinity is one of the major problems in agriculture, limiting crop growth in many parts of the world. In Egypt, salinity problem affected 1/3 of the irrigated lands (2.000. 000 acre) and consequently the productivity of the crops are affected (Antar 1981).

Saline soils contain sufficient amount of salts to suppress plant growth through a series of interacting factors including osmotic potential effects, specific ion toxicity and antagonism which induce nutritional imbalances and deffi-ciencies.

Improving rice production under saline soil conditions could be achieved through the introduction of improved varieties characterised with high grain yield potential, pest resistance and tolerance to adverse soil conditions as well as through the optimization of the cultural practices which minimize the adverse effects of salinity.

Nitrogen application is considered one of the key factors for obtaining higher rain yield. Because of the shortage of locally produced fertilizer nitrogen, high cost of the nitrogen unit and low nitrogen use efficiency, the development of practices to improve the effeciency of fertilizer nitrogen for rice in salt affected soils is greatly needed.

Gupta *et al.* (1975) applied 120 kg N/ha to rice cultivar IR 28, either fully through soil or as 50% through soil and the rest as successive foliar sprays of 5% urea solution. They reported that the latter treatment gave higher grain number/ panicle, productive tillers/plant and greater paddy yield. Zedan *et al.* (1980) reported that three rice varieties, Arabi, Giza 159 and IR 2061-281-76 responded well to the application of nitrogen either fully through soil or partially through N soil and the rest through foliage. Abd El-Rahman *et al.* (1988), indicated that rice varieties showed significant differences in grain yield and its components under salt affected soil.

De *et al.* (1971), applied 17.8 kg N/ha as 20% urea spraying solution and obtained an increase of 15% in paddy yield over the un-sprayed control. Rao and Padmanabhan (1971), reported that the highest grain yield was obtained when 100 kg N/ha was applied as 25% before sowing, 50% in four foliar sprays at seven days intervals beginning from 28 days after sowing and 25% as top dressing at panicle initiation. Puttaswamy (1975) reported that the application of 62 kg N/ha as one to four foliar sprays increased paddy yield through increasing the number of panicles/ plant and 1000-grain weight. Fanyan and Yakovlev (1977) found that the foliar application of 20% of the rate of nitrogen to rice at the milk to wax ripe stage increased paddy yields by about 800 kg/ha and improved grain quality. Polisetly *et al.* (1987) found that foliar nitrogen rate from 30 to 180 kg N/ha increased paddy yield of rice. Stafan and Stefan (1990) revealed that the rice yield increased with increasing liquid N fertilizer through foliage. Mandal *et al.* (1991) applied up to 200 kg N/ha as 100% soil application, 50% soil + 50% foliar application or 75% soil + 25% foliar. They reported that plant height, number of panicles/m2, straw yield and grain yield were greatest when 75% of N was applied to soil and the rest

through foliage. Taha *et al.* (1992) found that foliar nutrition of urea significantly increased rice grain and straw yields as well as their attributes as compared with the control.

The present work aimed to study the performance of three rice varieties as under different concentrations of foliar sprayed Urea-N under saline soil conditions.

MATERIALS AND METHODS

Two field experiments were conducted under salt affected soil at el-Sirw Agricultural Reearch Station Farm, Damietta, Egypt, during 1995 and 1996 growin seasons through rice salinity program. The investigation was devoted to study the productivity of three rice varieties namely Giza 178, Sakha 101 and Sakha 102 as affected by five foliar sprayed nitrogen levels (0, 5%, 10%, 15% and 20% of urea solution) foliary sprayed twice, 330 days after transplanting and 10 days later, at the volume of 238 liter/ha each time. Urea fertilizer used had 46%N.

The experiment was a split plot design with five replications. Rice varieties were arranged in the main plots while the subplots received the foliar applied nitrogen levels. The plot size was 10m2 and the preceding crop was clover in both seasons. Soil chemical analysis of the experimental area over both seasons revealed that EC; 9.7 ds/m2, pH = 8, cations meq/L were as follows: Na+ =47, Ca++ + Mg++= 31 and K+ = 0.34 and the anions Meq/L were as follows: CO33 = 1.0, Cl-=45 and SO4 ==31, and N content (pp) = 29. Cultural practices were conducted following the recommendations for transplanted rice.

At harvest, plants of ten guarded hills were used 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
7. Grain and straw yields

The plants in the inner six square meters of each sub-plot were harvested and transported to the threshing floor for air drying. Five days later the plants were threshed and the grains were separated and weighed at 14% moisture content. Grain and straw yields were experessed in tons/hectare.

The data of each experiment were subjected to statistical analysis of variance and a combined analysis was performed for the data of both seasons (Gomes and Gomes, 1984). Differences among means of the studied traits were judged by the significant differences (LSD) at 5% level of signifcance.

RESULTS AND DISCUSSION

Table1 summarize the results of the combined analysis of variance for the 1995 and 1996 seasons relating to the effect of varieties and levels of foliar applied nitrogen and their interaction on yield and its major components. The important findings are as follows:

1. Varietal differences:

The three tested varieties differ significantly in plant height, number of panicles/m2, number of filled grains/panicle, 1000-grain weight, panicle weight, grain and straw yield. Giza 178 produced the highest number of panicles/m2, number of filled grains/panicle, grain and straw yields (t/ha) and produced the lowest 1000-grain weight and panicle weight. Sakha 102 produced the tallest plants and the lowest number of panicles/m2, number of filled grains/panicle, panicle weight, grains yield and straw yield. Sakha 101 produced the shortest plants and the heaviest panicles. The superiority of Giza 178 in grain yield may be attributed to its superiority in number of panicles/m2 and number of filled grains/panicle. Similar results were reported by Zedan *et al.* (1980) and Abd El-Rahman *et al.* (1988).

2. Concentrations of foliar spray of urea-N effects:

Levels of foliar nitrogen had significant effects on the grain yield and all other studied traits. The results indicated that increasing urea-N from 0 to 20% resulted in a progressive increase in plant height, panicle length, number of panicles/m2, number of filled grains/panicle, 1000-grain weight, panicle weight, grain and straw yields. The continuous increase in rice yield and contributing characters due to increasing the level of urea-N from 0-20% could be attributed to the application of N through the foliage which overcomes the nutritional imbalances and difficiencies

Table 1. Yield and yield attributes of three rice varieties as influenced by different levels of foliar applied urea under saline soil conditions (combined data over 1995 and 1996 seasons)

Treatment	Plant height (cm)	Panicle length (cm)	No.of panicles /m2	No.of filled grains/ panicle	1000-grain weight (g)	Panicle weight (g)	Grain yield (t/ha)	% Increase over the lowest grain yield	Straw yield (t/ha)
Varieties:									
Sakha 102	101.0	20.4	405	116.9	27.1	3.1	6.1	-	8.9
Sakha 101	86.6	21.0	420	125.1	27.0	3.4	6.8	10	9.0
Giza 178	88.7	21.0	455	137.2	19.9	7.6	7.6	25	9.9
F test	**	N.S.	**	**	**	**	**	-	**
LSD 0.05	1.3	-	4.5	0.63	0.12	0.14	0.14	-	0.07
Ureatreatment %:									
0	83.5	17.9	300	113.3	22.8	4.6	4.6	-	6.2
5	92.6	20.5	420	121.5	24.3	6.8	6.8	48	9.6
10	93.7	21.3	453	126.1	24.9	7.3	7.3	59	9.9
15	94.7	21.8	468	131.9	25.3	7.6	7.6	65	10.2
20	95.9	22.4	498	139.1	26.0	7.9	7.9	71	10.6
F test	**	**	**	**	**	**	**	-	**
LSD 0.05	0.9	0.5	8.3	1.32	0.28	0.22	0.22	-	0.32
Interaction	N.S.	N.S.	N.S.	**	N.S.	**	**	-	*

caused by the interacting role of osmotic potential, specific ion effects and antagonism which are dominant under saline soil conditions. These results are in agreement with those reported by Rao and Padmanabhan (1971), De *et al.* (1971), Puttaswamy (1975), and Mandal *et al.* (1992).

The data suggested that under saline soil conditions which contain sufficient amount of salts to suppress plant growth, foliar application of nitrogen is needed to increase the nitrogen use efficiency and to save fertilizer nitrogen.

Interaction effects of varieties X levels of foliar applied nitrogen

Number of filled grains/panicle, grain yield and straw yield as affected by varieties X levels of foliar applied nitrogen interaction are listed in Table 2. The data showed that the highest number of filled grains/panicle, grain yield and straw yield were produced when Giza 178 received the highest level of foliar applied urea (20%), while the lowest number of filled grain/panicle and straw yield and grain yield were produced when Sakha 102 and Sakha 101, respectively received no nitrogen. Zedan *et al.* (1980) reported differential response of some rice varieties to the applied N.

Table 2. Number of filled grainss/panicle as well as grain and straw yield as affected by varieties X levels of foliar applicatied N interaction under saline soil conditions (combined analysis of 1995 and 1996 seasons).

Treatment	N level (%)	No. filled grains/panicle	Grain yield (t/ha)	Straw yield (t/ha)
Varieties:				
Sakha 102	0	104.2	4.40	5.47
	5	114.0	6.15	8.95
	10	117.0	6.40	9.50
	15	121.2	6.74	9.94
	20	128.0	6.90	10.50
	Mean	116.9	6.10	8.90
Sakha 101	0	115.4	4.10	5.82
	5	122.6	6.69	9.78
	10	123.8	7.45	9.83
	15	127.8	7.75	10.00
	20	136.0	8.20	10.21
	Mean	125.1	6.80	9.10
Giza 178	0	120.4	5.14	7.04
	5	128.0	7.63	10.11
	10	137.6	7.94	10.45
	15	146.6	8.23	10.68
	20	153.2	8.83	11.07
	Mean	137.2	7.60	9.90
LSD 0.05		0.98	0.18	0.20

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تأثير تركيزات معدلات مختلفة من اليوريا المضافة بطريقة الرش على إنتاجية بعض أصناف الأرز تحت ظروف الأراضى الملحية

أحمد أحمد محمد عبد الرحمن

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

أجريت تجربتان حقليتان تحت ظروف الأراضى الملحية بمزرعة محطة البحوث الزراعية بالسرو محافظة دمياط خلال موسمى ١٩٩٥ ـ ١٩٩٦ لدراسة سلوك ثلاثة أصناف من الأرز جيزة ١٧٨ مقارنة بالاصناف الجديده سخا ١٠١ سخا ١٠٢ تحت تأثير خمسة تركيزات من سماد اليوريا أضيفت رشا على النباتات وهى صفر ، ٥٪ ، ١٠٪ ، ١٥٪، ٢٠٪ وكانت درجة التوصيل الكهربائى EC = ٩,٧ لمحلول التربة ودرجة حموضة التربة pH = ٨ فى موقع التجربة.

ويمكن تلخيص نتائج هذه الدراسة على النحو التالى:

– أعطى الصنف جيزة ١٧٨ أكثر عدد داليات /م٢ وأكبر عدد حبوب فى الدالية وكذلك أعلا محصول للحبوب والقش، فى حين أعطى الصنف سخا ١٠٢ أقل عدد داليات / م٢ وعدد حبوب فى الدالية ووزن دالية وكذلك محصول الحبوب والقش.

– زيادة مستوى اليوريا المرشوشة من صفر إلى ٢٠٪ أدى إلى زيادة مستمرة فى قيم كل من طول النبات وطول الدالية وعدد الداليات/م٢ وعدد الحبوب / دالية ووزن الألف حبة ووزن الدالية وكذلك محصول الحبوب والقش.

– ظهر تفاعل معنوى بين العوامل تحت الدراسة فى صفات عدد الحبوب / دالية ومحصول الحبوب والقش.