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GENETIC VARIABILITY AND PERFORMANCE OF SOME PROMISING RICE GENOTYPES AS AFFECTED BY NITROGEN FERTILIZER UNDER SALT STRESS CONDITION

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ABSTRACT: Salinity is the main constrain and case yield reduction mainly in the coastal areas in the humid tropics and in arid and semiarid areas where evaporation exceeds precipitation. Egypt is one of these areas. To develop sustainable rice-production systems in areas where these stresses are located, cultivar tolerance is often essential as well as improved management plays an important role to alleviate soil hazards and increasing yield of the affected area. Field experiments were conducted at Rice Research and Training Center (RRTC), at Sakha as normal condition and El-Sirw as saline condition, during 2012 and 2013 seasons to study the performance of some rice genotypes under different nitrogen levels. The selected genotypes were; Giza178, GZ10306-7-1-1-2, GZ10355-9-1-1-4, GZ10154-3-1-1-1, PL-GE-101-SP-17, PL-101-SP-7 and IET 1444). Three nitrogen levels were used e.g. 0, 80 and 160 kg N ha^{-1}. Genotypes of Giza 178, GZ10355-9-1-1-4 and IET1444 showed good performance under both normal and saline soils regarding yield and yield components. Most of the traits under study had a wide range of variability. All cultivars mean squares for all studied traits were highly significant under normal and saline soil. Thus selection for given traits among these cultivars would be effective in all cases. The phenotypic coefficient of variability (PCV%) was higher than genotypic coefficient variability (GCV%) in two years in all genotypes for all traits, indicating that the most portion of PCV% was more contributed by environmental conditions and cultural practices.

Key words: *Rice, salinity, nitrogen fertilizer, heritability and genetic advance.*

INTRODUCTION

Rice (*Oryza Sativa L.*) is one of the world's most important crops, providing a staple food for nearly half of the global population (FAO, 2004). In Egypt, rice consider as the second important cereal crops after wheat as a main food for most of Egyptian population. Rice is grown mostly in the northern part of the Nile Delta. Most of these areas are classified as saline soils. Rice is one of the most suitable crops for improving saline soils although, it is usually considered moderately sensitive to salinity (Mori and kinoshita, 1987). Grain yield is considered the main objective in the rice breeding program. It is dependent on yield component traits. The reduction of grain yield and its components under saline soil for different genotypes were reported by many researchers (Zayed, 2006, Zeng, *et al.,* 2002 and Zeng, 2004).

Salt stress is a major constraint across many rice production areas because of the high sensitivity of modern rice varieties. Salinity is particularly a major problem in coastal regions in the tropics where rice-based farming systems predominate. Salt stress is also a worsening problem in inland areas because of the buildup of salinity as a consequence of excessive use of irrigation water with improper drainage coupled with the use of poor quality irrigation water (Ismail *et al.* 2010). Rice is considered sensitive to salinity, particularly during early vegetative and later at reproductive stages. Nonetheless, it is one of the few crops that can thrive on salt-affected soils because of its ability to grow well in standing water that can help leach salts from topsoil and is, therefore, recommended as an entry crop for desalinization of salt affected lands (Ismail *et al,.* 2007 and Singh *et al.,* 2010).

One possible solution to this problem is introduction of improved salt tolerant varieties, or hybridization between these varieties and local high yielding potential genotypes. Genetic information about the type and the magnitude of the genetic variances should be studied, to develop and sustain high yielding rice genotypes with salinity tolerance. Rao *et al.* 2008 reported that genotype by environment analysis revealed the high degree of genetic diversity (and significant environmental effects) for the growth attributes and grain yield under both salinity and alkalinity stress. Present results pointed out the possibility of exploiting beneficial potentials of the genotypes identified as tolerant to salinity, alkalinity or to both salinity and alkalinity stresses and to targeting appropriate cultivars to specific environments.

Increasing rice production under salt affected area can be achieved also through improving management system of crop culture, especially the nutrient management of the crop. Nitrogen fertilizer is one of the most important inputs and limiting factors realizing the potential rice grain production in the world. Use of 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. Residual soil N may be available for subsequent crops in the next season, but such N is highly susceptible to leaching during non-crop periods (Fageria and Baligar, 2003).

The main objectives of the present study are to: 1) evaluate the performance of different rice genotypes under normal and saline soil conditions, 2) identify the most desirable genotypes as donors in future breeding programs through identifying selective characters, 3) study the effect of different nitrogen levels on vegetative and yield and its components of the genotypes under study and 4) estimate the phenotypic, genotypic, heritability and genetic advance for all studied traits.

MATERIALS AND METHODS

This investigation was carried out in the Rice Research and Training Center (RRTC), at Sakha, (Kafr El-Sheikh Governorate) as normal condition and El-Sirw, (Damietta Governorate) as a saline condition, during 2012 and 2013 seasons. Seven genotypes are presented in Table (1). were used in this investigated. Three nitrogen levels were used (0, 80 and 160 kg N ha^{-1}) in the urea form (46.5 % N) in two equal splits application, i.e. half as basal and incorporated into the soil immediately before flooding, followed by the second dose after 30 days from transplanting., to study the response of some rice genotypes to nitrogen fertilizer.

Soil was sampled, before cultivation, the part of it stored in the refrigerator for chemical analysis and the other for physical analysis according to Cottein *et al.* (1982) and Page *et al.* (1982). The physical and chemical properties of the experimental field soils are given in Table (2).

Table (1): Rice genotypes, parentage, type and origin.

No	Genotypes	Parentage	Type	Origin
1	Giza 178	(Giza 171 / Milyang 49)	Indica Japonica	Egypt
2	GZ10306-7-1-1-2	GZ7768-10-1-5-2 / Suweon379	Japonica	Egypt
3	GZ10355-9-1-1-4	GZ7456-6-5-3 / BY–6 –20	Japonica	Egypt
4	GZ10154-3-1-1-1	GZ6522 / Sakha101	Japonica	Egypt
5	PL-GE-101-SP-17	Sakha101 / HR5824	Japonica	Egypt
6	PL-101-SP-7	Sakha101 / Gaori	Japonica	Egypt
7	IET 1444	(TN1 x CO 29)	Indica	India

Table (2). Some physical and chemicals analysis of the soil at the experimental sites during 2012 and 2013.

Properties Locations		PH	EC Ds/m	Soluble cations, meq. L^{-1}				Soluble anions, meq. L^{-1}		
				Na^+	Ca^{++}	Mg^{++}	K	HCO_3	CL	SO_4
Sakha	2012	8.10	2.24	19.1	5.6	6.3	0.5	6.12	14.8	11.8
	2013	8.11	2.43	20.4	6.2	7.8	0.5	6.32	15.9	11.9
El-Sirw	2012	8.02	8.19	90.4	19.5	28.1	1.1	7.01	59.2	64.6
	2013	8.00	8.11	86.4	20.1	29.3	1.0	7.16	56.0	65.1

Sowing date was done on April 25th at Sakha as normal condition and May 10th at El-Sirw location as saline soil, respectively in 2012 and 2013 seasons. After 28 days, the seedlings were transplanted to the experimental field with three replications for each genotype was grown in five rows (five meters long) and contained 25 hills and which distances of 20 x 20 cm between rows and hills. The other agricultural practices were applied as recommended.

Two field experiments in each location were laid-out in a split plot design with three replications. The main plots were devoted to the seven rice genotypes. The sub plots were allocated the three nitrogen levels (0, 80 and 160 kg N ha^{-1}). A combined analysis was used between the two locations in each season. Bartlett's test was used to assess homogeneity of error variances prior to combine analysis over environments. The studied characters included, plant height (cm), chlorophyll content (SPAD), flag leaf area (cm^2), days to heading, panicle weight (g), number of panicles per plant, fertility percentage, grain yield (t/ha) and salinity index. The SPAD reading was taken by a chlorophyll meter (SPAD-502, Minolta Camera Co., Japan).

Salinity index (SI):The salinity index (SI) for grain yield was calculated by the formula of Dwivedi *et al.,* (1991) as follows:-

$$\text{Salinity Index} = \frac{\text{Grain yield under saline condition}}{\text{Grain yield under normal condition}} \times 100$$

Analysis of variance was used to estimate the genotypic variance (б^2 g), environmental variance (б^2 e), phenotypic variance (б^2 ph) and percentage of genotypic (GCV %) and phenotypic (PCV %) coefficient of variation components according to the formula suggested by Burton (1952). Genetic advance upon selection (ΔG) and as percentage of the mean (ΔG %) was computed according to Johnson *et al.,* (1955).

RESULTS AND DISSECTION

1- Mean performance of vegetative characters:

1-1. Vegetative characters: Data in Tables (3) and (4) showed that plant height affected significantly by locations, genotypes, nitrogen fertilizer application and their interactions. The salinity condition (El-Sirw site) had negative effect on plant height for all rice genotypes under study compared with normal condition (Sakha). Plant height increased significantly by increasing nitrogen levels. Nitrogen fertilization has favorable effect on improving rice growth, photosynthesis, metabolism and assimilates production leading to improving plant height as result of raising cell elongation. The present results are in similarity with those claimed by Zayed *et al.* (2006) and Metwally *et al.* (2010).

Table (3) : Plant height (cm), chlorophyll content (SPAD) at heading, Flag leaf area (cm^2) and days to heading of rice genotypes as affected by nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

Factor	Plant height (cm)		Chlorophyll content SPAD		Flag leaf area (cm^2)		Days to heading (days)	
	2012	2013	2012	2013	2012	2013	2012	2013
Locations L:								
Sakha	106.50	102.08	44.52	41.22	34.86	33.53	102.63	101.63
El-Siraw	83.43	80.60	39.49	36.82	17.89	17.20	101.64	100.49
F-test	**	**	**	**	**	**	*	**
Genotypes G:								
Giza178	96.93	93.13	39.78	36.50	29.78	29.33	101.82	100.39
GZ10306-7-1-1-2	91.02	87.58	42.44	39.59	22.10	21.22	97.69	96.71
GZ10355-9-1-1-4	100.52	94.31	41.46	39.30	22.82	21.85	103.11	102.17
GZ10154-3-1-1-1	93.05	89.50	42.09	38.93	24.55	23.63	97.75	96.82
PL-GE-101-SP-17	94.28	89.13	43.87	41.28	29.45	28.29	100.34	99.52
PL-101-SP-7	91.92	90.04	44.32	40.88	26.16	24.89	99.31	98.22
IET 1444	97.04	95.70	40.10	36.65	29.78	28.34	114.89	113.60
L.S.D.0.05	1.03	0.97	0.55	0.56	0.70	0.70	0.48	0.62
Kg N ha^{-1} N:								
0	92.29	88.51	39.07	36.17	22.55	21.69	99.52	98.58
80	94.57	91.49	42.06	39.05	26.84	25.73	102.02	100.80
160	98.04	94.03	44.90	41.84	29.75	28.67	104.86	103.81
L.S.D.0.05	0.46	0.65	0.52	0.35	0.42	0.41	0.36	0.32
Interaction								
L X G	**	**	**	**	**	**	**	**
L x N	**	**	**	**	**	**	**	*
G X N	**	**	**	*	**	**	*	**
L x G X N	**	**	**	**	**	**	**	**

Table (4) : Plant height (cm) as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	102.55	106.93	107.27	98.42	103.23	102.27
	GZ10306-7-1-1-2	101.20	104.91	111.66	92.33	100.67	107.07
	GZ10355-9-1-1-4	110.65	116.72	118.07	106.11	109.64	113.16
	GZ10154-3-1-1-1	101.87	105.59	111.66	97.78	101.63	107.00
	PL-GE-101-SP-17	95.47	102.21	106.93	91.05	98.74	102.27
	PL-101-SP-7	99.52	105.25	107.27	95.22	100.34	103.55
	IET 1444	103.56	106.60	110.55	102.59	104.19	106.43
El-Sirw	Giza178	86.70	88.04	90.07	82.72	83.36	88.81
	GZ10306-7-1-1-2	75.63	76.24	76.57	72.46	74.07	78.87
	GZ10355-9-1-1-4	83.66	87.70	86.36	76.95	80.15	79.83
	GZ10154-3-1-1-1	85.68	75.23	78.26	81.44	74.07	75.03
	PL-GE-101-SP-17	86.36	88.72	86.02	79.19	81.44	82.08
	PL-101-SP-7	75.23	76.24	88.05	81.12	79.51	80.47
	IET 1444	84.00	83.66	93.78	81.76	89.77	89.45
L.S.D.0.05		1.96			1.90		

Concerning the interaction effects, the tallest plants were produced by GZ10355-9-1-1-4 rice genotype at both seasons when it fertilized with 160 kg N ha^{-1} under normal condition. In addition, at EL-Sirw site, IET 1444 rice genotype gave the tallest plants at 160 kg N ha^{-1} followed by Giza178 at the same nitrogen level in the two seasons. The current data confirmed the superiority of Giza 178 and IET 1444 under salt stress. The present findings are in a good agreement with those reported by Zayed *et al.* (2006).

Data in Tables (3) and (5) indicated that locations, genotypes, nitrogen fertilizer application and their interactions affected significantly chlorophyll content (SPAD values) at heading. It could be observed that Sakha location produced higher chlorophyll content values than El-Sirw location Chlorophyll content increased significantly by increasing nitrogen levels under the two locations; Sakha and EL-Sirw in 2012 and 2013 seasons. These results proved that chlorophyll content increased by raising nitrogen fertilizer that attributed to the role of nitrogen in enhancing chlorophyll formation and it is favorable effect on assimilates production. The present results are in similarity with those claimed by Luo and Li (2000). The rice genotype PL-101-SP-7 recorded the highest values of chlorophyll content compared with the other genotypes.

Concerning the interaction effects, increasing nitrogen rate significantly boosted up the chlorophyll content of all tested rice genotypes under both normal and saline conditions. The highest values of chlorophyll content at heading under normal condition were produced by PL-101-SP-7, GZ10306-7-1-1-2, Giza178 and PL-GE-101-SP-17 rice genotypes when it fertilized with 160 kg N ha^{-1} in both seasons . Moreover, at EL-Sirw site, Giza 178 and IET 1444 rice genotypes gave the lowest chlorophyll content values. Generally, the chlorophyll content was degrading or decrease in all rice genotypes when planted under saline soil. These indicated that chlorophyll content affected significantly by saline soil. The present findings are in a good agreement with those reported by Alvarez (1997).

Table (5): Chlorophyll content (SPAD) as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

.locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	40.18	42.21	49.30	36.56	38.99	44.15
	GZ10306-7-1-1-2	39.51	44.57	49.30	36.86	41.42	45.98
	GZ10355-9-1-1-4	39.51	45.25	46.94	38.99	41.42	43.55
	GZ10154-3-1-1-1	40.86	42.55	46.93	37.17	38.08	44.76
	PL-GE-101-SP-17	42.21	46.26	48.62	38.99	43.85	46.28
	PL-101-SP-7	42.89	46.94	50.31	39.59	43.24	45.67
	IET 1444	40.86	44.24	45.59	38.08	39.59	42.33
El-Sirw	Giza178	34.92	35.24	36.86	30.97	33.01	35.34
	GZ10306-7-1-1-2	38.80	39.45	43.00	35.63	37.08	40.58
	GZ10355-9-1-1-4	37.18	37.18	42.68	35.63	35.92	40.29
	GZ10154-3-1-1-1	38.15	41.06	43.00	35.34	38.54	39.70
	PL-GE-101-SP-17	38.80	43.33	43.97	36.21	41.16	41.16
	PL-101-SP-7	38.15	44.30	43.33	35.63	40.87	40.29
	IET 1444	34.2	36.21	38.80	30.68	33.59	35.63
L.S.D.0.05			1.73			1.29	

Data in Tables (3) and (6) indicated that there was a significant effect due to different factors and their interaction on flag leaf area. Flag leaf area values at Sakha location were more than the values of El-Sirw location. Data showed also that salinity conditions had negative effect on the flag leaf area (cm^2) for all rice genotypes compared with that under normal soil (Sakha). Flag leaf area was significantly increased by increasing nitrogen level at the two locations (Sakha and EL-Sirw) during 2012 and 2013 seasons. Flag leaf area was significantly responded to nitrogen fertilizer up to the highest nitrogen level of 160 kg N ha^{-1} at both locations. In fact, nitrogen fertilization has positive effect on rice plants, It improve rice growth, photosynthesis, metabolism and assimilates production leading to improving flag leaf area. Among genotypes, Giza178, PL-GE-101-SP-17 and IET1444 had the highest flag leaf area compared with the rest of other genotypes. The present results are in similarity with those claimed by Mhaskar *et al.* (2005), Zayed *et al.* (2006) Metwally *et al.* (2010).

According to the interaction effects (Table 6.), increasing nitrogen levels significantly boosted up the flag leaf area of all tested rice genotypes. The highest values of flag leaf area were produced by Giza 178 rice genotype when fertilized with 160 kg N ha^{-1} under normal condition (Sakha site). Also, at EL-Sirw site, Giza 178 rice genotype gave the highest values of flag leaf area under the highest nitrogen level.

Results in Tables (3) and (7) indicated also that days to heading increased significantly by different factors and their interactions. Rice plants which transplanted at Sakha location needed more days to reach complete heading than plants which transplanted at El-Sirw location during 2012 and 2013 seasons. IET1444 required more days to reach the complete heading compared with the other genotypes. Days to heading was significantly responded to nitrogen fertilized up to the highest nitrogen level of 160 kg N ha^{-1}.

Table (6): Flag leaf area (cm^2) as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	29.39	41.08	45.76	28.76	41.63	44.77
	GZ10306-7-1-1-2	28.39	27.39	28.39	24.99	27.18	28.76
	GZ10355-9-1-1-4	24.72	29.39	33.73	24.68	27.81	30.95
	GZ10154-3-1-1-1	24.72	34.40	38.41	24.36	32.84	37.55
	PL-GE-101-SP-17	38.41	40.08	41.08	36.60	37.86	39.75
	PL-101-SP-7	24.05	37.41	42.42	22.79	34.72	41.63
	IET 1444	36.07	42.42	44.42	34.72	39.75	41.94
El-Sirw	Giza178	18.70	20.37	23.38	18.08	19.03	23.74
	GZ10306-7-1-1-2	14.36	15.36	18.70	13.69	15.26	17.45
	GZ10355-9-1-1-4	14.03	16.37	18.70	14.00	15.88	17.77
	GZ10154-3-1-1-1	14.02	16.36	19.37	13.69	15.26	18.08
	PL-GE-101-SP-17	16.37	18.70	22.04	16.20	18.40	20.91
	PL-101-SP-7	15.70	17.70	19.71	14.32	17.45	18.40
	IET 1444	16.70	18.70	20.74	16.82	17.14	19.65
L.S.D.0.05		1.55			1.58		

Table (7): Days to heading as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	101.35	102.36	103.70	99.99	100.96	103.24
	GZ10306-7-1-1-2	93.97	95.031	102.02	93.47	94.45	101.29
	GZ10355-9-1-1-4	103.70	105.04	109.40	102.26	103.89	108.12
	GZ10154-3-1-1-1	92.63	94.64	103.36	92.50	93.80	102.59
	PL-GE-101-SP-17	99.67	101.69	104.04	98.68	100.96	102.60
	PL-101-SP-7	94.64	99.34	101.69	93.47	98.03	100.64
	IET 1444	111.08	115.78	119.81	110.08	114.31	118.86
El-Sirw	Giza178	98.51	101.82	103.15	97.87	99.80	100.45
	GZ10306-7-1-1-2	95.52	99.17	100.17	94.97	97.23	98.84
	GZ10355-9-1-1-4	99.17	101.49	99.83	97.87	100.77	100.13
	GZ10154-3-1-1-1	96.85	97.84	101.16	95.30	96.90	99.80
	PL-GE-101-SP-17	96.18	99.50	101.16	95.94	98.84	100.13
	PL-101-SP-7	99.83	100.17	100.17	98.84	98.84	99.48
	IET 1444	110.12	114.10	118.41	108.81	112.35	117.17
L.S.D.0.05		1.29			1.28		

The interaction effect between rice genotypes and nitrogen levels significantly affected days to heading in the two years of study in both experimental sites. Increasing nitrogen rate significantly boosted up the days to heading of all tested rice genotypes. The earliest genotype for heading date (92.63 and 92.50) was GZ10154-3-1-1-1 under control treatment in normal soil condition i.e. Sakha site. In addition, at EL-Sirw site, GZ10306-7-1-1-2 rice genotype was the earliest genotype for days to heading (95.52 and 94.97) in the first and second seasons, respectively that was under zero nitrogen level. On the other side, IET 1444 rice genotype recorded the latest date of heading (118.41 and 117.17) in 2012 and 2013 seasons, respectively. The present findings are in a good agreement with those reported by Zayed *et al.* (2006).

1-2- Yield and its components:

panicle weight (g), number of panicles per hill, fertility percentage and grain yield (t/ha) are presented in Tables (8) to (12) . It is clear that the saline condition at El-Sirw site had negative effect on the all yield and yield components at the different nitrogen fertilization levels for all rice genotypes compared with normal soil.

The rice genotypes differed significantly in all traits. The heaviest panicles produced by PL-GE-101-SP-17 (3.38 and 3.26 for the two seasons resp.) on the other hand the lightest panicles produced by GZ10306-7-1-1-2 (2.96 and 2.83 for the two seasons resp.). As for number of panicles / hill Giza 178 genotype gave the highest values (21.50 and 20.16), in the two seasons respectively, while GZ10306-7-1-1-2 recorded the lowest values (16.32 and 15.45 for the two seasons resp.). Regarding the fertility %, PL-GE-101-SP-17 recorded the highest percentage (89.81 and 89.58% for the two seasons resp.), while the genotypes PL-101-SP-7 recorded the lowest percentage (86.24 and 85.60% for the two seasons resp.). For grain yield t ha^{-1}, Giza 178 recorded the greatest values (6.55 and 6.39 t ha^{-1} for the two seasons resp.), while the genotype GZ10306-7-1-1-2 recorded the lowest values (4.44 and 4.27 t ha^{-1} for the two seasons resp.).

Table (8): Panicle weight (g) , number of panicles hill^{-1}, fertility % and grain yield (t ha^{-1}) of rice genotypes as affected by nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

Factor	Panicle weight (g)		No. of panicle hill^{-1}		Fertility %		Grain yield (t ha^{-1})	
	2012	2013	2012	2013	2012	2013	2012	2013
Locations L:								
Sakha	4.33	4.18	91.87	91.40	91.87	91.40	8.22	7.88
El-Siraw	2.01	1.96	84.41	83.53	84.41	83.53	3.06	3.05
F-test	**	**	**	**	**	**	**	**
Genotypes G:								
Giza178	3.37	3.27	89.06	88.69	89.06	88.69	6.55	6.39
GZ10306-7-1-1-2	2.96	2.83	87.90	86.56	87.90	86.56	4.44	4.27
GZ10355-9-1-1-4	3.07	2.94	87.66	86.85	87.66	86.85	5.52	5.33
GZ10154-3-1-1-1	2.91	2.91	89.37	88.42	89.37	88.42	6.15	6.10
PL-GE-101-SP-17	3.38	3.26	89.81	89.58	89.81	89.58	6.09	5.87
PL-101-SP-7	3.31	3.15	86.24	85.60	86.24	85.60	5.46	5.31
IET 1444	3.20	3.14	86.93	86.57	86.93	86.57	5.29	5.00
L.S.D.0.05	0.06	0.08	0.82	0.55	0.82	0.55	0.23	0.17
Kg N ha^{-1} N:								
0	2.83	2.72	90.05	89.05	90.05	89.05	4.68	4.59
80	3.16	3.07	88.55	87.86	88.55	87.86	5.85	5.60
160	3.52	3.43	85.81	85.49	85.81	85.49	6.41	6.21
L.S.D.0.05	0.04	0.06	0.63	0.44	0.63	0.44	0.14	0.12
Interaction								
L X G	**	**	**	**	**	**	**	**
L x N	**	**	**	**	**	**	**	**
G X N	**	**	**	**	**	**	**	**
L x G X N	**	**	*	**	*	**	**	**

Regarding to the effect of nitrogen levels on yield and yield components in the 2012 and 2013 seasons, the results indicated that all traits gives significantly responded to nitrogen fertilizer up to highest nitrogen level of 160 kg N ha^{-1} except for fertility% which recorded the highest percentage at control treatment. Nitrogen fertilization has a favorable effect on improving rice growth, photosynthesis, and metabolism and assimilates production leading to increasing most of traits except, fertility %. The present results are in similarity with those claimed by Zayed *et al.* (2006) and Metwally *et al.* (2011).

As for interaction effect, Giza 178 in combined with 160 kg N ha^{-1} gave the heaviest panicle under saline soil while PL-101-SP-7 with the same nitrogen level produced the heaviest one under normal soil. the combinations of Giza178 and 160 kg N ha^{-1} gave the highest values of number of panicles per hill and gain yield under both sites in 2012 and 2013 seasons. Rao *et al.* 2008 indicated that the marked effect of salinity on grain yield was largely due to a reduction of seed set in the panicles which resulted in increase in spikelet sterility due to fertilization failure or pollen grain apportion.

Table (9) : Panicle weight (g) as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	3.47	4.21	4.82	3.30	4.08	4.70
	GZ10306-7-1-1-2	3.44	4.01	4.68	3.29	3.79	4.57
	GZ10355-9-1-1-4	3.91	4.41	4.72	3.75	4.28	4.41
	GZ10154-3-1-1-1	3.90	4.07	4.75	3.79	4.08	4.67
	PL-GE-101-SP-17	4.21	4.65	4.82	4.08	4.51	4.67
	PL-101-SP-7	3.97	4.55	5.42	3.59	4.51	5.19
	IET 1444	3.51	4.24	5.22	3.56	3.95	5.07
El-Sirw	Giza178	2.39	2.63	2.73	2.32	2.52	2.71
	GZ10306-7-1-1-2	1.79	1.89	1.95	1.67	1.79	1.86
	GZ10355-9-1-1-4	1.59	1.79	1.99	1.44	1.83	1.96
	GZ10154-3-1-1-1	1.48	1.59	1.69	1.43	1.63	1.83
	PL-GE-101-SP-17	2.09	2.22	2.29	1.99	2.16	2.16
	PL-101-SP-7	1.85	1.95	2.09	1.79	1.86	1.96
	IET 1444	1.99	2.05	2.19	2.03	2.03	2.22
L.S.D.0.05			0.15			0.20	

Table (10): No. of panicles hill^{-1} as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons during 2012 and 2013 seasons during 2012 and 2013 seasons.

locations	Genotypes	Kg N ha^{-1}					
		2012			2013		
		0	80	160	0	80	160
Sakha	Giza178	16.55	25.33	27.69	15.24	24.12	26.35
	GZ10306-7-1-1-2	16.55	20.94	24.65	14.93	19.36	23.17
	GZ10355-9-1-1-4	16.21	22.96	22.96	14.92	21.58	21.58
	GZ10154-3-1-1-1	18.91	21.27	23.64	17.78	20.00	22.22
	PL-GE-101-SP-17	16.88	20.60	23.97	15.87	19.68	22.21
	PL-101-SP-7	14.86	21.95	24.31	13.97	20.63	23.17
	IET 1444	17.90	19.25	22.96	16.82	18.09	21.27
El-Sirw	Giza178	18.23	20.26	20.94	17.46	18.09	19.68
	GZ10306-7-1-1-2	9.79	11.82	14.18	9.84	12.38	13.01
	GZ10355-9-1-1-4	16.21	16.21	17.90	14.92	17.14	14.60
	GZ10154-3-1-1-1	14.52	19.59	20.26	13.01	17.78	18.09
	PL-GE-101-SP-17	17.56	19.59	21.27	16.82	18.41	20.00
	PL-101-SP-7	11.82	16.21	17.90	10.79	14.28	18.09
	IET 1444	15.20	19.59	20.26	14.60	18.73	19.36
L.S.D.0.05			1.26			1.29	

As for, fertility %, the highest values of fertility % were produced by GZ10355-9-1-1-4 when fertilized with 80 kg N ha^{-1} under normal conditions at Sakha site while, under saline soil PL-GE-101-SP-17 in combined with 80 kg N ha^{-1} gave the highest values in both seasons. Rao *et al.* 2008 confirmed the adverse effects of salt stress on pollen viability as reflected in reduced floret fertility. That these criteria could be used for selection of the choice of parents which posses this trait for breeding programs.

Table (11): Fertility % as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons.

locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	93.35	92.08	90.19	92.76	91.05	90.64
	GZ10306-7-1-1-2	93.38	92.79	90.77	91.35	91.13	90.27
	GZ10355-9-1-1-4	93.34	93.78	92.51	92.42	93.39	92.89
	GZ10154-3-1-1-1	94.60	92.46	92.87	93.85	93.09	92.73
	PL-GE-101-SP-17	91.01	89.52	91.92	90.51	89.20	91.2
	PL-101-SP-7	90.93	89.72	88.07	90.15	89.32	87.56
	IET 1444	94.03	92.54	89.34	93.89	93.01	88.89
El-Sirw	Giza178	89.68	86.83	82.22	89.04	86.84	81.81
	GZ10306-7-1-1-2	86.27	84.97	79.25	85.01	83.93	77.64
	GZ10355-9-1-1-4	81.73	83.86	80.71	81.62	79.30	81.46
	GZ10154-3-1-1-1	87.79	84.24	84.28	83.24	85.57	82.04
	PL-GE-101-SP-17	79.76	91.22	85.44	90.65	89.39	86.45
	PL-101-SP-7	87.21	84.31	77.21	86.30	83.79	76.46
	IET 1444	87.69	81.37	76.59	85.83	81.05	76.75
L.S.D.0.05		2.20			1.72		

The tested rice genotypes showed differential reactions to salinity regarding to their grain yield. It could be noticed that GZ10306-7-1-1-2 genotype gave the lowest values of grain yield under saline condition irrespective nitrogen level, while Giza 178 recorded the highest values of grain yield under the same condition followed by PL-GE-101-SP-17. The data indicated that GZ10306-7-1-1-2 is more salt sensitive genotype. Both rice cultivars of Giza 178 and PL-GE-101-SP-17 could be used as a donor for salt –tolerance character. The differences in rice grain yield and its components among genotypes may be due to genetic background and constitution of genotype, environmental conditions and soils condition and status. These results are in a good agreement with those reported by Zayed *et al.* (2006).

Salinity index was decreased by increasing nitrogen level during the two seasons (Table 14). Rice genotypes differ in salinity index. IET1444 genotype recorded the highest values of salinity index (50.54 and 52.40) in 2012 and 2013 seasons respectively followed by Giza178. GZ10306-7-1-1-2 recorded that lowest percentage of salinity index indicated that GZ10306-7-1-1-2 gnotype is sensitive to salinity while IET1444 genotype is tolerant to salinity.

2- Phenotypic, genotypic variability, heritability and genetic advance.

Estimate of phenotypic, genotypic coefficient variability, heritability, and genetic advance are presented in Tables 14, 15 and 16. The results showed that most of the traits under study had a wide range of variability. This wide range was reflected in the variation among tested cultivars, where all cultivars mean squares for all traits were highly significant under normal and saline soil. Thus selection for given traits among these cultivars would be effective in all cases. Similar results were obtained by Aidy *et al.* (1992), El-hity and El-keredy (1992) and (Hammoud *et al.* 2009). The phenotypic coefficient of variability (PCV%) was higher than genotypic coefficient variability (GCV%) in all genotypes for all traits, indicating that the most portion of PCV% was more contributed by environmental conditions and cultural practices.

Table (12): Grain yield (t ha^{-1}) as affected by the interaction between rice genotypes and nitrogen levels under normal and saline conditions during 2012 and 2013 seasons during 2012 and 2013 seasons.

locations	Genotypes	2012			2013		
		Kg N ha^{-1}			Kg N ha^{-1}		
		0	80	160	0	80	160
Sakha	Giza178	6.82	9.02	10.85	6.57	8.65	11.12
	GZ10306-7-1-1-2	6.16	8.36	9.53	5.72	7.98	9.15
	GZ10355-9-1-1-4	5.98	9.20	10.12	5.49	8.76	9.68
	GZ10154-3-1-1-1	7.70	9.17	9.61	7.45	8.94	9.32
	PL-GE-101-SP-17	7.33	8.87	9.24	7.34	8.37	8.69
	PL-101-SP-7	6.29	8.36	9.02	6.25	7.80	8.54
	IET 1444	6.38	6.89	7.77	5.97	6.64	7.06
El-Sirw	Giza178	3.81	4.18	4.62	3.53	3.92	4.52
	GZ10306-7-1-1-2	0.72	0.94	0.92	0.75	0.91	1.10
	GZ10355-9-1-1-4	2.42	2.64	2.75	2.73	2.65	2.68
	GZ10154-3-1-1-1	3.01	3.67	3.78	3.64	3.57	3.67
	PL-GE-101-SP-17	3.15	3.74	4.22	3.25	3.53	4.03
	PL-101-SP-7	2.79	3.15	3.15	2.75	3.07	3.42
	IET 1444	2.90	3.67	4.11	2.86	3.57	3.92
L.S.D.0.05		0.52			0.43		

Table (13): Salinity index of rice genotypes as affected by nitrogen levels during 2012 and 2013 seasons.

Genotypes	2012				2013			
	Kg N ha^{-1}							
	0	80	160	Mean	0	80	160	Mean
Giza178	55.87	46.34	42.58	48.26	53.73	45.32	40.65	46.56
GZ10306-7-1-1-2	11.69	11.24	9.65	10.86	13.11	11.40	12.02	12.18
GZ10355-9-1-1-4	40.47	28.70	27.17	32.11	49.73	30.25	27.69	35.89
GZ10154-3-1-1-1	39.09	40.02	39.33	39.48	48.86	39.93	39.38	42.72
PL-GE-101-SP-17	42.97	42.16	45.67	43.60	44.28	42.17	46.38	44.28
PL-101-SP-7	44.36	37.68	34.92	38.99	44.00	39.36	40.05	41.14
IET 1444	45.45	53.27	52.90	50.54	47.91	53.77	55.52	52.40
Mean	39.99	37.06	36.03		43.09	37.46	37.38	

Table (14): Genotypic (GCV%) and phenotypic (PCV%) coefficient variability, **heritability and (G A) for plant height, chlorophyll content and flag leaf area at Sakha and El-Sirw locations (average of the two seasons 2012 and 2013) under different nitrogen fertilizer levels.**

Kg N ha^{-1} / Genotypes	Sakha								
	Plant height (cm)			Chlorophyll content (SPAD)			Flag leaf area (cm^2)		
	0	80	160	0	80	160	0	80	160
Variance	78.1**	51.8**	46.5**	6.61**	12.6**	8.0**	100.3**	105.0**	117.6**
Error	0.8	0.635	0.75	0.915	1.09	1.245	1.08	0.92	1.68
σ^2_g	25.78	17.06	15.26	1.9	3.83	2.25	33.1	34.7	38.65
σ^2_{ph}	26.58	17.695	16.01	2.815	4.92	3.495	34.18	35.62	40.33
Gcv%	5.015	3.89	3.575	3.405	4.375	3.14	19.62	16.34	15.77
Pcv%	5.09	3.965	3.665	4.155	5.03	3.92	19.935	16.555	16.115
Heritability	97.125	96.315	95.31	66.855	74.605	64.325	96.855	97.445	95.82
GA	10.25	8.31	7.855	2.32	3.465	2.48	11.665	11.98	12.535
GA%	10.18	7.865	7.195	5.75	7.91	5.195	39.77	33.225	31.805
	El-Sirw								
Variance	56.9**	104.1**	101.0**	83.96**	56.37**	24.73**	9.72**	8.34**	13.23**
Error	2.115	3.12	4.035	4.83	0.515	0.76	0.57	0.635	1.1
σ^2_g	18.29	33.69	32.35	26.375	18.62	7.99	3.05	2.565	4.045
σ^2_{ph}	20.405	36.81	36.385	31.205	19.135	8.75	3.62	3.2	5.04
Gcv%	5.20	7.08	6.72	12.13	9.765	6.28	11.135	9.13	9.835
Pcv%	5.495	7.405	7.135	13.125	9.9	6.575	12.135	10.21	11.155
Heritability	89.305	91.4	88.54	86.885	97.265	91.135	84.155	79.95	76.835
GA	8.26	11.425	11.02	9.785	8.75	5.555	3.3	2.95	3.61
GA%	10.135	13.96	13.05	23.165	19.84	12.355	21.055	16.835	17.885

Table (15): Genotypic, phenotypic, heritability and genetic advance for days to heading, panicle weight and number of panicles plant^{-1} at Sakha and El-Sirw locations in the two seasons (2012 and 2013) under different nitrogen fertilizer levels.

Kg N ha^{-1} / Genotypes	Sakha								
	Days to heading			Panicle weight g			Number of panicles plant^{-1}		
	0	80	160	0	80	160	0	80	160
Variance	126.5**	151.0**	127.4**	0.245**	0.200**	0.240**	4.54**	11.71**	8.61**
Error	0.62	0.63	0.455	0.03	0.01	0.01	0.42	0.55	0.36
σ^2_g	41.985	50.15	42.32	0.075	0.06	0.08	1.375	3.72	2.75
σ^2_{ph}	42.605	50.78	42.775	0.105	0.07	0.09	1.795	4.27	3.11
Gcv%	6.55	6.99	6.155	7.16	5.89	5.7	7.11	8.965	6.9
Pcv%	6.6	7.03	6.185	8.57	6.345	6.06	8.125	9.605	7.34
Heritability	98.55	98.76	98.945	71.395	86.105	88.46	76.455	87.145	88.21
GA	13.25	14.5	13.325	0.465	0.48	0.54	2.11	3.705	3.205
GA%	13.395	14.31	12.615	12.51	11.265	11.04	12.81	17.245	13.36
	El-Sirw								
Variance	73.53	98.98	137.79	0.305	0.3	0.3	34.31	28.255	22.26
Error	0.745	3.155	0.665	0.0035	0.006	0.009	0.39	0.775	1.03
σ^2_g	24.265	31.94	45.705	0.1	0.1	0.095	11.305	9.16	7.075
σ^2_{ph}	25.01	35.095	46.37	0.105	0.1	0.105	11.695	9.935	8.105
Gcv%	4.915	5.53	6.505	17.08	15.595	14.66	21.71	16.87	14.225
Pcv%	4.99	5.79	6.555	17.375	16.07	15.32	22.08	17.585	15.215
Heritability	97.03	91.66	98.58	96.575	94.1	91.48	96.67	91.955	87.53
GA	9.995	11.125	13.825	0.64	0.625	0.615	6.81	5.915	5.105
GA%	9.975	10.885	13.305	34.58	31.175	28.88	43.97	33.35	27.395

Table (16): Genotypic, phenotypic, heritability and genetic advance for fertility percentage and grain yield at Sakha and El-Sirw locations average of the two seasons (2012 and 2013) under different nitrogen fertilizer levels.

Kg N ha^{-1} / Genotypes	Normal condition					
	Fertility percentage			Grain yield t ha^{-1}		
	0	80	160	0	80	160
Variance	7.90**	13.52**	8.38**	1.18**	1.64**	4.36**
Error	0.765	0.31	0.645	0.115	0.04	0.03
σ^2_g	2.38	4.405	2.58	0.36	0.535	1.44
σ^2_{ph}	3.145	4.715	3.225	0.475	0.575	1.47
Gcv%	1.665	2.27	1.76	9.155	9.43	13.84
Pcv%	1.91	2.345	1.965	10.63	9.775	13.985
Heritability	75.68	93.44	80.31	75.22	93.02	97.95
GA	2.765	4.175	2.965	1.065	1.455	2.445
GA%	2.98	4.515	3.25	16.34	18.735	28.215
	Saline condition					
Variance	49.85**	24.74**	12.68**	2.44**	2.86**	3.68**
Error	1.8	3.15	0.55	0.055	0.07	0.06
σ^2_g	16.015	7.195	4.045	0.795	0.93	1.21
σ^2_{ph}	17.815	10.345	4.595	0.85	1	1.27
Gcv%	4.9	3.07	2.235	35.435	33.715	35.38
Pcv%	5.18	3.69	2.385	36.665	34.965	36.25
Heritability	89.51	71.405	87.9	93.45	93.02	95.29
GA	7.795	4.66	3.88	1.775	1.915	2.21
GA%	9.57	5.365	4.32	70.565	66.985	71.15

Data of phenotypic coefficient of variability (PCV%) and genotypic coefficient of variability (GCV%) for plant height, chlorophyll content and flag leaf area are presented in Table 14. The results showed that the PCV% was higher than GCV% under normal and saline soil. However, the GCV% of plant height was ranged from 3.57 to 5.01% at Sakha station and 5.20 to 12.13% at El-Sirw station under different nitrogen levels. For chlorophyll content, GCV% was lower than PCV% and the value ranged from 3.14 to 4.37% at Sakha location and 6.28 to 12.13% at El-Sirw station. Also, flag leaf area data showed that GCV% was ranged from 15.77 to 19.62 at Sakha and 9.13 to 11.13 at El-Sirw station under different nitrogen levels.

Concerning flag leaf area, Table 14. showed that higher values of GCV% and PCV% under Sakha station compared with El-Sirw. The GCV% ranged from 15.77 to 19.62% at Sakha and 9.13 to 11.13% at El-Sirw under different nitrogen levels.

As for days to heading, GCV% under Sakha station ranged from 6.15 to 6.99% and 4.91 to 6.50% at Sakha and El-Sirw, respectively (Table 14). On the other hand, GCV% for Panicle weight and number of panicles/plant, were ranged from 5.71 to 7.16% and 6.9 to 8.96 at Sakha station and 14.66 to 17.8% and 14.22 to 21.71% at El-Sirw station, respectively.

Concerning for fertility%, data in (Table 15) showed that GCV% were ranged from

1.69 to 2.27% and 2.23 to 4.9% at Sakha and El-Sirw stations. While, grain yield character data in (Table 15) revealed that GCV% ranged from 9.15 to 13.84% at Sakha and 33.71 to 35.43% at El-Sirw station. These results are in agreement with those of Babar *et al.* (2007), Hammoud *et al.* (2009) and El-Malky and Hammoud (2012).

Heritability:

Heritability % was estimated as a ratio between the genotypic variance (numerator) and the total phenotypic variance (denominator) and the latter was reduced by the small components of the genetic x environmental (G x E) interaction which was not significant for all studied traits. However, estimates of heritability in broad sense was high for all studies traits indicated that the genetic variance (additive and non-additive play an important role in inheritance for all traits (Table 14,15 and 16). Similar results were obtained by Balan *et al.* (2000), Rasheed *et al.* (2002), Karim *et al.* (2007), Babar *et al.* (2007), Hammoud *et al.* (2009) and El-Malky and Hammoud (2012).

Genetic advance:

Genetic advance (GA%) under selection which are given in Tables 14, 15 and 16 showed the possible gain from selection as percent increase in the value of genetic advance from generation to generation when the selected most desirable 5% from plants. Genetic advance under selection was estimated under normal and saline soil. For flag leaf area, genetic advance gave higher values ranged from 31.80% to 39.77% at Sakha and El-Sirw stations over the two years compared with plant height and chlorophyll content. On the other hand, the number of panicles per plant showed highest values of genetic advance % varied from 27.40 to 43.97 for the two season respectively under saline soil indicated that the selection procedures are preferred under saline soil compared with days to heading and panicle weight (Table 15). Concerning grain yield, genetic advance % under best 5% plants selection were higher under El-Sirw which ranged from 66.98 to 71.15% compared with other traits. These results indicated that the improvement of this trait more effective when selection was done under saline condition compared with normal condition. Similar results were obtained by Mruthunjaya and Mahadevappa (1995), Hammoud *et al.* (2009) and El-Malky and Hammoud (2012).

Dixit *et al.* (1970) stated that high heritability is not always associated with high genetic gain, but in order to make effective selection high heritability should be associated with high genetic gain. In the present investigation, high genetic gain was found to be associated with high heritability estimated for flag leaf area, number of panicles hill^{-1} and grain yield t ha^{-1} under the two locations in the two years of the study. Consequently, selection for these traits under normal and saline soils should be effective and satisfactory for successful breeding purposes.

Conclusion

It could be concluded that the new promising line of GZ10355-9-1-1-4 showed good performance under both normal and saline soils regarding yield and yield components and could be use as donor in breeding program for salt tolerant. Giza 178 and IET1444 still have a good performance under saline condition also could be used as salt tolerant donor moreover, gene pyramiding concept must be done when gene identification will be done and aggregate all different genes in one genotype through MAS approach.

REFERENCES

Aidy, I.R., A.E. Draz and A.A.M. Abd El-Rahman (1992). Genetic variability of some varieties and lines of rice under saline soil conditions. Proc. 5th Conf. Agron., Zagazig, 13-15 Sep., (1):174-183.

Alvarez, L.E. (1997). Growth, yield and quality and cost effectiveness of nitrogen fertilizer application to commercial rice cultivars in Venezuela. I. Rainy season 1993. Revista-Unellez-de-Ciencia-y-Tecnologia,-Produccion-Agricola. 15☹1), 121-143.

Babar, M., A.A. Khan, A. Arif, Y. Zafar and M. Arif (2007). Path analysis of some leaf and panicle traits affecting grain yield in doubled haploid lines of rice (Oryza sativa L.). J. Agric. Res. 45(4): 245-252.

Balan, A., A.R. Muthiah and S.N.M.R. Boopathi (2000). Genetic variability, character association and path coefficient analysis in rainfed rice, under alkaline condition. Madras Agricultural Journal. 86(1/3): 122-124.

Burton, G.W. (1952). Quantitative inheritance in grass. Proc. 6th Int. Crossed Cong. 1:227-283.

Cottein, A., P.M. Verloo, L. Kiekens, G. Velghe and R. Camerlynek (1982). Chemical Analysis of Plants and Soils. Lab. Agrochem. State Univ., Gent. Belgium.

Dixit, P.K., P.D. Saxema and L.K. Bhaha (1970). Estimation of genotypic variability of some quantitative characters in groundnut. Ind. J. Agric. Sci. 40:197:201

Dwivedi, K.N., C.N. Chaubey and N.R. Gupta (1991). Study of saline-alkali soil resistance in rice (Oryza sativa L.). Oryza (28): 265-267.

El-Hity, M.A. and M.S. El-Keredy (1992). Genotypic variability, phenotypic correlations and path coefficient analysis of grain yield and its components in rice (Oryza sativa L.). J. Agric. Res. Tanta Univ. 18(2): 299-311.

El-Malky, M.M. and S.A A. Hammoud (2012). Utilization of diallel analysis crosses in developing elite promising lines of rice. Egypt. J.Agric. Res., 90 (4): 163- 189

Fageria, N.K. and V.C. Baligar (2003). Methodology for evaluation of lowland rice genotypes for nitrogen use efficiency. J. Plant Nutr. 26:1315-1333.

FAO. (2004). The state of food and agriculture 2003-2004. Agricultural Biotechnology. Meeting the needs of the poor. Food and agriculture organization of the United Nations.

Hammoud, S. A. A., R. A. S. EL-Shafey, S.E.M. Sedeek and M.M. H. EL-Malky (2009). Genetic analysis of some rice promising lines derived from cross (Giza 177 × HR 5824-B-3-2-3) for yield and its components and resistance to blast disease. 6th International Plant Breeding Conference, Ismalia , Egypt . 365-383.

Ismail, A.M., M.J. Thomson, G.V. Vergara, M.A. Rahman, R.K. Singh, G.B. Gregorio et al. (2010). Designing resilient rice varieties for coastal deltas using modern breeding tools. In: Hoanh CT, Szuster BW, Pheng KS, Ismail AM, Nobel AD, editors. Tropical Deltas and coastal zones: food production, communities and environment at the land-water interface. Wallingford: CAB; 2010. p. 154–65.

Ismail, A.M., S. Heuer, M.J. Thomson, M. Wissuwa (2007). Genetic and genomic approaches to develop rice germplasm for problem soils. Plant Mol Biol. 2007;65:547–70.

Johnson, H.W., H.F. Robinson and R.E. Comstock (1955). Estimates of genetic and environmental variability in soybean. Agron. J. 47: 314-318.

Karim, D., U. Sarkar, M.N.A. Siddique, M.A. Khaleque Miah and M.Z. Hasnat (2007). Variability and genetic parameter analysis in aromatic rice. Int. J. Sustain. Crop Prod. 2(5):15-18.

Luo, L.H. and A.H. Li. (2000). Effects of nitrogen fertilizers on leaves of early-season indica rice. Journal-of-Hunan-Agricultural-University, 26(4): 250-252.

Metwally, T.F., E.E. Gewaily, E.S. Naeem and M. M. El-Malky (2011). Response of different promising rice genotypes to various nitrogen levels. J. Plant Production, Mansoura Univ., 2(3): 507-520.

Metwally, T.F., S.E.M. Sedeek, A.F. Abdelkhalik and I.M. El-Rewiny (2010). Varietal differences in physiological efficiency of nitrogen utilization in rice. Egypt. J. Agric. Res., 88 (1): 361-382.

Mhaskar, N.V., J.H. Dongale, A.A. Dademal and S.A. Khanvilkar (2005). Performance of scented rice varieties under different nitrogen levels in lateritic soil of Konkan . Oryza. 42(4): 323-326.

Mori, I.K. and T. Kinoshita (1987). Salt tolerance of rice callus clones. Rice Genet. News1,4:112-113.

Mruthunjaya, C.W. and M. Mahadevappa (1995). Genetic variability, heritability and genetic advance for yield and its contributing characters in ratoon crop of rice (Oryza sativa L.). Mysore J. Agric. Sci. 29:285-288.

Page, A.L., R.H. Miller and D.R. Keeney (1982). Methods of Soil Analysis- Part 2. Amer. Soc. Agric. Inc. Madison.

Rao, P.S., B. Mishra, S. R. Gupta and A. Rathore (2008). Reproductive stage tolerance to salinity and alkalinity stresses in rice genotypes. Plant Breeding 127, 256—261

Rasheed, M.S., H.A. Sadaqat and M. Babar (2002). Correlation and path co-efficient analysis for yield and its components in rice (Oryza sativa L.). Asian J. of Plant Sciences. 1(3): 241-244.

Singh, R.K., E.D. Redoña and L. Refuerzo (2010). Varietal improvement for abiotic stress tolerance in crop plants: special reference to salinity in rice. In: Pareek A, Sopory SK, Bohnert HJ, Govindjee, editors. Abiotic stress adaptation in plants: physiological, molecular and genomic foundation. New York: Springer; 2010. p. 387–415.

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 Univ., 31(12): 7497- 7597.

Zeng, L., M.C. Shannon and C.M. Grieve (2002). Evaluation of salt tolerance in rice genotypes by multiple agronomic parameters. Euphytica. 127(2): 235-245.

Zeng, L.H. (2004). Response and correlated response of yield parameters to selection for salt tolerance in rice. Cereal Research Communications. 32(4): 477-484.

الاختلافات في أداء بعض تراكيب الأرز الوراثية المبشرة نتيجة تأثرها بالسماد النيتروجيني تحت ظروف الملوحة

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الملخص العربي

أجري هذا البحث في مزرعة مركز البحوث والتدريب في الأرز بسخا – محافظة كفرالشيخ و مزرعة محطة البحوث الزراعية بالسرو محافظة دمياط في موسمي ٢٠١٢و ٢٠١٣م. وكان الهدف من الدراسة تقدير الأداء لبعض تراكيب الأرز الوراثية وكذلك تقدير الكفاءة الوراثية والتحسن الوراثي المتوقع لها بعد انتخاب أفضل ٥% من النباتات الجيدة للصفات المدروسة وهي طول النبات (سم) ، محتوى الكلوروفيل (SPAD)، مساحة الورقة العلم (سم^{٢})، عدد الأيام حتى التزهير، وزن السنبلة (جم)، عدد السنابل بالجورة، نسبة الخصوبة وكذلك محصول الحبوب (طن للهكتار). وكان التصميم الإحصائي المستخدم في كلا الموقعين هو القطع المنشقة مرة واحدة حيث وضعت التراكيب الوراثية في القطع الرئيسية في حين وضعت مستويات النيتروجين في القطع المنشقة. وتم إجراء تحليل مشترك لكلا الموقعين. استخدمت التراكيب الوراثية الآتية (جيزة١٧٨ – IET1444 – والسلالات المبشرة : PL-GE-101-SP-17 – GZ10154-3-1-1-1 – GZ10355-9-1-1-4 – GZ10306-7-1-1-2 – PL-101-SP-7). وتم استخدام ثلاث مستويات من التسميد النيتروجيني هي ٠ ، ٨٠ ، ١٦٠ كجم نيتروجين للهكتار.

وكانت أهم النتائج المتحصل عليها كالأتي: الصنفان جيزة١٧٨ و IET1444 والسلالة المبشرة GZ10355-9-1-1-4 أظهرت أداءا جيدا تحت ظروف التربة العادية والملحية من حيث صفات المحصول ومكوناته. أظهرت الدراسة ارتفاع قيمة التباين المظهري عن التباين الوراثي لجميع الصفات المدروسة. أعطت الكفاءة الوراثية تحت ظروف التربة العادية والمالحة قيم وراثية أعلى من ٩٠% لغالبية الصفات المدروسة مما يدل على دور كل من التباين الوراثي المضيف والغير مضيف في وراثة تلك الصفات .أظهرت قيمة التحسن الوراثي المتوقع لانتخاب أحسن ٥% من النباتات قيم عالية لمعظم الصفات المدروسة.

وخلاصة هذا البحث هو وجود سلالة مبشرة (GZ10355-9-1-1-4) تجود تحت ظروف التربة العادية والمالحة ممكن استخدامها مستقبلا كصنف يتحمل الملوحة وفي برامج التهجين كمعطي لنقل صفة تحمل الملوحة. ويمكن بعد التعرف على جينات التحمل المختلفة ان وجدت يتم عمل أهرمة لهذه الجينات في تركيب وراثي واحد إذا أمكن معرفة مساعدات الانتخاب لكل هذه الجينات.