EVALUATION OF SOME RICE GENOTYPES UNDER NORMAL AND SALINE SOIL CONDITIONS

By

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SUMMARY

This study was carried out at the Experimental Farm of Rice Research and Training Center (RRTC), at Sakha, (Kafr El-Sheikh Governorate) and El-Sriw, (Damietta Governorate) Egypt, during 2009 and 2010 seasons. The main objective of this investigation was evaluated the performance of different rice genotypes (*Oryza sativa* L.) under normal (Sakha) and saline (El-Sriw) soil conditions. Two separate field trials were conducted under normal and saline conditions at two different locations (Sakha and El-Sriw). The treatments in both seasons were as follows: The ten rice genotypes i.e., Giza 178, Giza 177, Sakha 104, Sakha 103, Sakha 105, GZ6296, GZ6903, SK28-79-2-5-8-4, SK28-115-20-5-7-1 and Sakha 101 were growing in two locations Sakha (normal soil) and El-Sriw (saline soil). The two experiments were laid out in randomize complete block design with three replications. The main results obtained can be summarized as follows:-

The results showed that the salinity condition i.e. El-Sirw site have negative effect on the plant height, flag leaf area (cm^2), duration to maturity (days), number of panicles/hill, panicle length, number of filled grains/ panicle and 1000-grain weight (g), where it decreased significantly under saline soil condition (EL-Sriw) for all rice genotypes compared with that under normal soil condition (Sakha). The highest mean values of these characters were obtained under normal soil condition. Also, the highest grain yield (t/ha) was obtained under normal soil (Sakha) while, the lowest one was produced under saline soil (EL-Sriw) in both seasons.

There were varietal differences obtained among rice genotypes in all studied characters in both seasons. SK28-115-20-5-7-1 rice variety significantly surpassed the other rice varieties in plant height, flag leaf area (cm^2), number of panicles/hill, panicle length and number of filled grains/panicle. While, Giza 178 recorded the highest values of flag leaf area (cm^2), number of panicles/hill and number of filled grains/ panicle. The highest grain yield (t/ha) was produced by Giza 178 and SK28-115-20-5-7-1 in the first and second seasons, respectively.

The interaction between location and rice variety had a highly significant effect on grain yield (t/ha) in both seasons, whereas, salinity conditions had negative effect on grain yield (t/ha) which decreased under saline soil (EL-Sriw) compared with that under normal soil (Sakha). The highest grain yield (t/ha) in both seasons were obtained under sakha location by Sakha 101. Under El-Sirw site, SK28-79-2-5-8-4, SK28-115-20-5-7-1 recorded the highest values in 2009 and Giza 178, SK28-115-20-5-7-1 in 2010 season. This indicates that SK28-79-2-5-8-4 and SK28-115-20-5-7-1 rice varieties are tolerant to salinity.

INTRODUCTION

Rice (*Oryza sativa*, L.) is one of the most important staple food crops, which feeds more than half of the world's human population (Zhao, 2009 *et al.*) and rice is considered one of the most important field crops in Egypt. In nature, plants often experience harsh environmental conditions such as salinity. These conditions can delay growth and development, reduce yield and, in extreme cases, can inflict lethal injuries to the plant. To ensure survival, plants have evolved a range of response strategies to the various abiotic stresses likely to be encountered. The responses to a specific stress may vary with the genotype; nevertheless, some general reactions occur in all genotypes. At the whole plant level, the effect of stress is usually perceived as a decrease in photosynthesis and growth associated with alteration in carbon and nitrogen metabolism (Cornic and Massacci, 1996 and Morsy *et al.* 2007). A biotic stress is a major limiting factor in crop production. Physiological comparisons between contrasting abiotic stress-tolerant genotypes will improve understanding of stress-tolerant mechanisms (Morsy *et al.* 2007).

Salinity is the major obstacles for increasing rice production not only in Egypt but also worldwide. The total area affected by mineral toxicity is about 25% of the world's potentially arable land. Nearly one third of the 230 million hectares of land irrigated worldwide has become saline (McWilliams, 1986). One possible solution to salinity problem is introduction of improved salt tolerant varieties, or hybridization between these varieties and our local high yielding potential varieties and good grain quality. Genetic information about the type and the magnitude of the genetic variances should be studied, to develop and sustain high yielding rice varieties with salinity tolerance.

Zayed 2002, Zeng *et al.*, 2002, Zeng, 2004 and Mohamed (2010) reported that grain yield is considered the main objective in the rice breeding program. It is dependent on yield component traits. The grain yield and its components were reduced under saline soil for different genotypes.

Janardhan and Murty (1972) found that indica and japonica genotypes were capable to grow at levels of soil salinity up to 12 m mhos/cm. Indica varieties and hybrids showed a lower reduction in grain yield than the other. The decrease in yield was being mainly attributed to the effect of salinity on number of grains/panicle and 1000-grain weight.

The genetic behavior of most quantitative and morphological traits was reflected under normal soil with comparison saline soil conditions, in many investigations (Akbar and Ponnamperuma, 1986 and Mohamed 2010).

The present study aims to evaluate some different rice genotypes under saline and normal conditions.

MATERIALS AND METHODS

This study was carried out at the Experimental Farm of Rice Research and Training Center (RRTC), at Sakha, (Kafr El-Sheikh Governorate) and El-Sriw, (Damietta Governorate) Egypt, during 2009 and 2010 seasons. The main objective of this investigation was evaluate the performance of different rice genotypes (*Oryza sativa* L.) under normal and saline soil conditions.

Two separate field trials were conducted under normal and salinity conditions at the above two different locations (Sakha and El-Sriw conditions). The treatments in both seasons were as follows: The ten rice genotypes as shown in Table 1 were growing in two locations Sakha (normal soil) and El-Sriw (saline soil). Some chemical properties of the soils at the experimental sites during 2009 and 2010 seasons are given in Table (2). The two experiments were laid out in randomize complete block design with three replications.

Table (1): Names, pedigree and origin of rice genotypes.

	Entry	Pedigree	Origin
1	Giza 178	Giza 175/ Milyang 49	Egypt
2	Giza 177	Giza 171/Yomji No.1/PiNo.4	"
3	Sakha 104	GZ 4096-8-1/GZ4100-9	"
4	Sakha 103	Giza 177/Suweon 349	"
5	Sakha 105	GZ 5581-46-3/GZ4316-7-1-1	"
6	GZ6296	AC 1225/Hualien Yu 202	"
7	GZ6903	GZ 4596-3-4-2/Suweon 313	"
8	SK28-79-2-5-8-4	Giza 178/GZ6296-12-1-2-1-1	"
9	SK28-115-20-5-7-1	" "	"
10	Sakha 101	Giza 176/Milyang 79	"

Table (2): Some chemical properties of the soils at the experimental sites during 2009 and 2010 seasons.

Location	season	pH	EC dS/m	Cautions (meq.L^{-1})			Anions (meq.L^{-1})		
				Na	Ca + Mg	K	HCO_3	Cl	SO_4
Sakha	2009	8.10	2.95	14.8	13.44	1.76	6.00	8.30	15.70
	2010	8.19	3.10	15.2	13.98	1.80	6.75	8.44	17.79
EL-Sriw	2009	8.40	8.00	48.0	31.00	0.32	8.00	43.0	23.50
	2010	8.25	7.50	45.0	29.00	0.31	6.70	33.0	25.60

Nursery sowing date was first of May in the two locations in both seasons of study. After 30 days, seedlings were transplanted in the experimental field. Each genotype was grown in five rows (five meters long) and contained 25 hills with distances of 20 x 20 cm^2 and the numbers of seedlings per hill were 3-4 seedlings. The other agricultural practices were applied as recommended by (RRTC).

The following characters and observations were recorded i.e., plant height (cm), flag leaf area (cm^2) was estimated at heading stage according to the formula reported by Yoshida *et al.* (1976) as follows: - Leaf area (cm^2) = K x length (cm) x width (cm) where, K (K=0.75) is a correction factor, days to maturity, number of panicles per hill, panicle length, number of filled grains /panicle, 1000-grain weight (g) and grain yield (t/h).

Statistical procedures used in this study were done according to the analysis of variance and companied analysis technique by means of "IRRISTAT" computer software package as outlined by Pasqual (1994). L.S.D. test was used for the combined among genotypes means (Snedecur and Cochran, 1967).

RESULTS AND DISCUSSION

1. Plant height

Data in Table 3 indicate that highly significant differences were existed between the two locations on plant height (cm) of rice genotypes in both seasons. The tallest plants were obtained under Sakha location while, the shortest plants were found when plants growing under EL-Sriw location. The results showed that the salinity conditions i.e. El-Sirw site have a negative effect on plant height, where it decreased under saline soil (EL-Sriw) compared with that under normal soil (Sakha). These results are in agreement with those reported by Sakran (2007), Kuchanur *et al.* (2010), and Singh and Sharma. (2010)

Data in Table 3 indicated that significant variation among the tested varieties in plant height was detected. Sakha 104 and SK28-115-20-5-7-1 varieties were the tallest in 2009 and 2010 seasons, respectively while, GZ6296 genotype was the shortest in both seasons. This could be attributed to the difference in genetic back ground. These data are in agreement with those reported by Seong Lee *et al.* (2003) and Soltan (2006).

Data presented in Table 3 shows that plant height were highly significant affected by the interaction between location and rice variety. The tallest plants were obtained by Sakha 104 variety under normal soil (Sakha location) in both seasons and the shortest plants were obtained by GZ6296 and Sakha 101 varieties under saline soil (EL-Sriw location) in 2009 and 2010 seasons, respectively. Concerning the behaviour of rice varieties under normal soil (Sakha) has favourable conditions for improving rice growth, photosynthesis, and metabolism and assimilates production leading to improving plant height as a result of raising cell elongation. In contrast, the salinity conditions have negative effect on the plant height. The present results are in similarity with those claimed by Chopra and Chopra (2004), Sakran (2007) and Mohamed (2010).

Table (3): Effect of variety (V), location (L) and their interaction on rice plant height (cm) in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	102.00	81.00	91.50	102.0	89.00	95.50
Giza 177	100.00	76.67	88.33	98.00	78.00	88.00
Sakha 104	104.33	82.33	93.33	105.00	85.00	95.00
Sakha 103	99.00	73.33	86.17	101.00	78.33	89.67
Sakha 105	102.00	76.00	89.00	100.00	86.67	93.33
GZ6296	84.00	70.00	77.00	91.00	75.00	83.00
GZ6903	96.00	82.00	89.00	94.67	85.00	89.83
SK28-79-2-5-8-4	100.00	84.00	92.00	101.00	79.67	90.33
SK28-115-20-5-7-1	99.67	83.33	91.50	100.17	93.33	96.75
Sakha 101	88.00	77.00	82.50	94.27	74.33	84.30
Mean	97.50	78.57	88.03	98.71	82.43	90.57
F test	(L) *	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	1.62	0.86	1.44	2.72	1.13	2.17

2. Flag leaf area

The largest flag leaf area (cm^2) was obtained under Sakha location (Table 4) while, the lowest one was found when plants, growing under EL-Sriw location in 2009 and 2010 seasons. The salinity conditions i.e. El-Sirw site have a negative effect on the flag leaf area, where it decreased significantly under saline soil (EL-Sriw) compared with that under normal soil (Sakha). These results are in agreement with those reported by Ashraf and Yousaf (1998), Zayed (2002), Hassan (2003) Ali *et al.* (2004) and Solten (2006).

Regarding to rice varieties, SK28-79-2-5-8-4, Giza 178 and GZ6903 varieties gave the highest flag leaf area without significant difference between them in the first season, and also Giza 178 and SK28-115-20-5-7-1 in the second season (Table 4). On the other hand, Giza 177 and Sakha 103 gave the lowest mean value of flag leaf area in 2009 and 2010 seasons, respectively. Similar findings were found by Zayed (2002), Hassan (2003) and Soltan (2006).

Data presented in Table 4 show that significant interaction effects between location and rice variety on flag leaf area in both seasons. Giza 178 variety in the first season and SK28-115-20-5-7-1 in the second season under normal soil (Sakha location) produced the highest flag leaf area. While, the Sakha 103 variety showed the lowest flag leaf area (cm^2) at El-Sirw location during 2009 and 2010 seasons.

3. Duration to maturity

The highest values of days to maturity (latest) were recorded at Sakha location, while the shortest period to maturity was found when rice plants growing at El-Sirw location (Table 5). This result may be due to that stress salinity conditions have a negative effect on the growth of rice plants. The obtained finding is in a harmony with those reported by Sakran (2007) and Mohamed (2010).

Table (4): Effect of variety (V), location (L) and their interaction on rice flag leaf area (cm^2) in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	33.07	27.37	30.22	40.50	23.50	32.00
Giza 177	20.93	19.00	19.97	28.10	16.77	22.43
Sakha 104	31.20	26.20	28.70	29.77	17.53	23.65
Sakha 103	24.03	17.17	20.60	24.60	15.50	20.05
Sakha 105	27.87	24.10	25.98	31.90	16.80	24.35
GZ6296	30.23	24.70	27.47	29.80	22.43	26.12
GZ6903	31.43	28.77	30.10	38.43	19.53	28.98
SK28-79-2-5-8-4	32.37	29.27	30.82	33.60	17.70	25.65
SK28-115-20-5-7-1	28.60	26.77	27.68	41.60	22.13	31.87
Sakha 101	27.47	24.20	25.83	34.80	19.53	27.17
Mean	28.72	24.75	26.74	33.31	19.14	26.23
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	0.25	0.66	0.89	0.66	0.65	0.93

The data in Table 5 indicate that rice genotypes differed significantly in their days to maturity where Sakha 101 followed by Sakha 104 recorded the latest days to maturity, while Sakha 105 followed by Sakha 103 genotypes had recorded the earliest days in the two seasons. The present results are in similarity with those claimed by Sakran (2007) and Mohamed (2010).

The interaction between location and rice variety had a highly significant effect on duration to maturity (days) in 2009 and 2010 seasons (Table 5). The highest period was obtained by Sakha 101 under normal and salinity soil, while the lowest values were recorded by Sakha 105 and Sakha 103 under salinity soil in both seasons (Table 5).

Table (5): Effect of variety (V), location (L) and their interaction on rice duration to maturity (days) in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	134.7	130.0	132.3	135.0	129.0	132.0
Giza 177	125.0	120.0	122.5	125.0	120.0	122.5
Sakha 104	136.0	130.0	133.0	136.0	129. 7	132.8
Sakha 103	124.0	119.0	121.5	121.0	114.0	117.5
Sakha 105	122.0	118.0	120.0	121.0	113.0	117.0
GZ6296	126.0	120.0	123.0	126.0	119. 7	122.8
GZ6903	136.7	129.0	132.8	132.7	124.3	128.5
SK28-79-2-5-8-4	129.0	121.0	125.0	128.0	120.3	124.2
SK28-115-20-5-7-1	125.0	120.0	122.5	127.0	120.0	123.5
Sakha 101	145.0	139.0	142.0	142.0	134.3	138.2
Mean	130.3	124.6	127.5	129.4	122.4	125.9
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	0.1	0.2	0.3	1.5	0.7	1.2

4. Number of panicles/hill

The highest number of panicles/hill was obtained under Sakha location, while the lowest one when rice plants growing at El-Sirw location in both seasons (Table 6). The results indicating that salinity stress conditions at EL-Sriw location caused significantly reduction in number of panicles/hill. Similar findings were found by Zayed (2002), Hassan (2003), Soltan (2006), Sakran (2007) and Mohamed (2010).

The data in Table 6 show that rice varieties Giza 178, SK28-115-20-5-7-1 and Sakha 101 gave the highest number of panicles/hill, while Sakha 177 and Sakha 103 gave the lowest one in both seasons. The variation in number of panicles/hill among the different rice genotypes could be attributed to the variation in their genetic construction. The varietal differences were reviewed by Abdullah *et al* (2001), Zayed (2002), Ali and Awn (2004), Yousef *et al.* (2004), Abou khalifa *et al* (2005), Aisha *et al.* (2005) and Mohamed (2010).

Number of panicles/hill was highly significant affected by. the interaction between location and rice variety in 2009 and 2010 seasons (Table 6). The highest number of panicles/hill was obtained under Sakha location by Giza 178 and Sakha 101 in the first and second seasons, respectively. While the lowest number of panicles/hill was obtained under EL-Sriw location by Giza 177 in both seasons. It could be attributed to the increase in Na under salinity soil in EL-Sriw location, where it affected number of effective tillers production. These results were in conformity with those reported by Abdullah *et al* (2001), Zayed (2002), Ali and Awn (2004), Yousef *et al* (2004) and Aisha *et al* (2005).

Table (6): Effect of variety (V), location (L) and their interaction on rice number of panicles/hill in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	25.00	14.67	19.83	24.0	15.00	19.50
Giza 177	19.00	10.00	14.50	19.0	10.00	14.50
Sakha 104	22.30	13.67	18.00	23.0	13.00	18.00
Sakha 103	21.00	11.00	16.00	20.33	11.00	15.67
Sakha 105	21.30	13.00	17.17	21.67	13.67	17.67
GZ6296	22.30	13.00	17.67	22.33	15.00	18.67
GZ6903	22.30	11.67	17.00	22.33	17.00	19.67
SK28-79-2-5-8-4	22.70	14.67	18.67	22.33	15.00	17.67
SK28-115-20-5-7-1	22.70	14.67	18.67	23.67	17.00	20.33
Sakha 101	23.00	14.67	18.83	24.33	14.33	19.33
Mean	22.17	13.10	17.63	22.10	14.10	18.10
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	0.63	0.43	0.65	0.86	1.06	1.50

5. Panicle length

Data in Table 7 shows that the longest panicle was obtained under normal conditions at Sakha location, while under saline conditions at EL -Sriw location panicle length (cm) was decreased significantly and recorded the shortest one in both seasons. Similar findings have been detected by Khan *et al* (2003), Hassan (2003), Soltan (2006) and Sakran (2007).

Panicle length (cm) of SK28-115-20-5-7-1 rice variety significantly surpassed the other rice varieties in both seasons (Table 7). Differences among rice genotypes in panicle length (cm) may be due to the genetic background for each genotype as well as interaction between the genotype and environmental factors. The present results are in similarity with those claimed by Sedeek (2001), Zayed (2002), Hegazy (2007) and Sakran (2007).

The highest values of panicle length (cm) were obtained at Sakha location by Sakha 101, Giza 178 in the first season and Giza 178, SK28-115-20-5-7-1in second seasons (Table 7). These results are in agreement with those reported by Abdullah *et al.* (2001), Zayed (2002), Ali and Awn (2004), Yousef *et al.* (2004) and Aisha *et al.* (2005).

Table (7): Effect of variety (V), location (L) and their interaction on rice panicle length (cm) in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	23.33	16.10	19.72	23.76	19.83	21.80
Giza 177	21.83	18.17	20.00	21.53	17.17	19.35
Sakha 104	22.70	15.70	19.20	22.23	19.00	20.62
Sakha 103	20.83	15.27	18.05	22.10	16.17	19.13
Sakha 105	21.50	15.43	18.47	22.47	17.77	20.12
GZ6296	22.17	14.87	18.52	22.70	18.87	20.78
GZ6903	22.80	18.47	20.63	22.87	18.33	20.60
SK28-79-2-5-8-4	22.67	18.67	20.67	22.20	17.50	19.85
SK28-115-20-5-7-1	22.23	19.33	20.78	23.37	20.27	21.82
Sakha 101	23.50	17.83	20.67	22.23	17.60	19.92
Mean	22.36	16.98	19.67	22.55	18.25	20.39
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	0.44	0.37	0.53	0.29	0.60	0.82

6. Number of filled grains/panicle

The two locations showed a highly significant effect on number of filled grains / panicle in both seasons (Table 8). The highest number of filled grains per panicle was obtained under Sakha location, while the lowest one was obtained at EL -Sriw location in 2009 and 2010 seasons. The results indicating that salinity conditions at El-Sirw site have a negative effect and caused significant reduction in number of filled grains per panicle compared with that in normal soil (Sakha) which boosted up the number of filled grains/panicle. These results are in accordance with those obtained by Yoshida Laths and Garcia and De-Azevedo (2000), Asch and Wopereis (2001), Khan *et al* (2003), Chopra and Chopra (2004), Sakran (2007) and Mohamed (2010).

Highly significant varietal differences were noticed in number of filled grains per panicle (Table 8). Giza 178 and Sakha 101 genotypes in the first season as well as SK28-115-20-5-7-1 and Giza 178 in the second one recorded the highest values, while Sakha 103 and Giza 177 genotypes recorded the lowest number of filled grains per panicle in both seasons. These results are in harmony with those recognized by Asch and Woperies (2001), Sakran (2007) and Mohamed (2010).

Table (8): Effect of variety (V), location (L) and their interaction on rice number of filled grains/panicle in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	148.33	131.33	139.83	153.00	115.00	134.00
Giza 177	125.33	103.00	114.17	122.33	93.33	107.83
Sakha 104	148.67	124.33	136.50	148.33	103.00	125.67
Sakha 103	128.00	100.00	114.00	132.33	90.67	111.50
Sakha 105	140.00	103.00	121.50	128.00	93.67	110.83
GZ6296	124.33	112.33	118.33	118.00	96.67	107.33
GZ6903	144.33	128.00	136.17	140.00	108.00	124.00
SK28-79-2-5-8-4	143.33	111.67	127.50	131.00	96.67	113.83
SK28-115-20-5-7-1	140.00	131.00	135.50	145.67	128.67	137.17
Sakha 101	151.00	125.00	138.00	152.00	101.00	126.50
Mean	139.33	116.97	128.15	137.07	102.67	119.87
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	5.69	1.93	4.33	5.59	3.95	5.99

The interaction effect between location and rice genotype had a highly significant effect on number of filled grains/panicle during the 2009 and 2010 seasons (Table 8). The highest number of filled grains/panicle was produced by Sakha 101, Giza 178 rice genotypes at normal condition (Sakha site). While, at EL -Sriw site, Sakha 103 rice genotype gave the lowest number of filled grains/panicle in the two seasons of study. The present findings are in a good agreement with those reported by Ebaid *et al.* (2005), Abou khalifa *et al.* (2005), Sakran (2007) and Mohamed (2010).

7. 1000-grain weight

1000-grain weight (g) was highly significant affected by the two locations (Table 9). The heaviest weight was obtained by growing rice under normal condition (Sakha location) comparing to growing under salinity soil at EL-Sriw location, which gave the lowest values of 1000-grain weight (g) in 2009 and 2010 seasons. These results are agreement with what reported by Asch and Wopereis (2001) and Sakran (2007).

Data in (Table 9), indicate. that there were varietal differences in 1000-grain weight among rice genotypes in both seasons. The rice varieties GZ6903, SK28-79-2-5-8-4 and Sakha 101 surpassed the other varieties in 1000-grain weight in both seasons. From going results GZ6903, SK28-79-2-5-8-4 and Sakha 101 rice varieties had high ability to produce adequate amount of carbohydrates, which improved grain filling process and resulted in heavy grains i.e. heavy 1000-grain weight. In this concern, varietal differences have been terminated by Sedeek 2001, El-Rewiany 2002, Zayed 2002, Abou Kalifa *et al.* 2005 and Hegazy 2007.

The interaction between location and rice variety exerted distinctly effect on 1000-grain weight (Table 9) in both seasons. Generally under normal condition (Sakha location) Giza 177, GZ6903 and SK28-79-2-5-8-4 rice varieties gave the heaviest 1000-grain weight in both seasons. While, under salinity conditions at EL-Sriw location Giza 178 rice variety gave the lightest 1000-grain weight in 2009 and 2010 seasons.

Table (9): Effect of rice variety (V), location (L) and their interaction on 1000-grain weight (g) in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	21.83	18.00	19.92	21.97	18.70	20.33
Giza 177	28.33	24.00	26.17	28.33	23.70	26.02
Sakha 104	26.67	24.00	25.33	27.67	23.67	25.67
Sakha 103	25.00	22.83	23.92	25.00	23.20	24.10
Sakha 105	28.33	24.67	26.50	28.33	24.00	26.17
GZ6296	24.00	20.00	22.00	23.00	21.00	22.00
GZ6903	28.67	24.70	26.68	28.33	25.00	26.67
SK28-79-2-5-8-4	28.33	25.37	26.85	28.67	24.37	26.52
SK28-115-20-5-7-1	27.00	22.50	24.75	26.00	23.00	24.50
Sakha 101	27.67	25.40	26.53	28.33	25.00	26.67
Mean	26.58	23.15	24.87	26.56	23.16	24.86
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	0.33	0.39	0.56	0.34	1.02	1.37

8. Grain yield

The highest grain yield was obtained under normal soil (Sakha) while, the lowest one was produced under saline soil (EL-Sriw) in both seasons (Table 10). The results indicating that salinity conditions had a negative effect on grain yield (t/ha) and caused significantly reduction in grain yield. The present results are in similarity with those claimed by Sakran (2007) who reported that the adversely effect of NaCl and $CaCl_2$ on most studied yield components such as number of effective tillers, panicle weight, panicle length and

1000-grain weight which reflected the earlier reduction of dry matter accumulation during the vegetative stage which on turn negatively affected the rice yield outturn. Many investigators came to similar results Zayed (2002), Hassan (2003), Zeng *et al* (2003), Prasad *et al,* (2004), Aisha *et al.* (2005), Soltan (2006) and Mohamed (2010).

The data in Table 10 showed that there were highly significant difference among rice varieties in grain yield (t/ha) in both seasons. Giza 178 and SK28-115-20-5-7-1 rice varieties gave the highest value of grain yield (t/ha) in the first and second seasons, respectively. While, Sakha 103 gave the lowest values in both seasons, that might be due to genetic background. Similar results were obtained by Zayed (2002), Hassan (2003), Soltan (2006), Sakran (2007) and Mohamed (2010).

Table (10): Effect of variety (V), location (L) and their interaction on rice grain yield (t/ha) in 2009 and 2010 seasons.

Variety (V)	2009 season			2010 season		
	Sakha	EL-Sriw	Mean	Sakha	EL-Sriw	Mean
Giza 178	11.100	6.100	8.600	10.367	4.267	7.317
Giza 177	9.600	3.267	6.433	9.800	2.300	6.050
Sakha 104	10.800	4.400	7.600	10.400	2.500	6.450
Sakha 103	10.100	2.200	6.150	10.050	1.583	5.817
Sakha 105	10.600	4.100	7.350	10.160	2.167	6.163
GZ6296	10.267	5.500	7.883	9.900	3.167	6.533
GZ6903	10.000	4.400	7.200	10.133	3.867	7.000
SK28-79-2-5-8-4	10.300	6.400	8.350	10.500	3.767	7.133
SK28-115-20-5-7-1	10.500	6.300	8.400	10.400	4.633	7.517
Sakha 101	11.367	4.237	7.802	10.300	2.733	6.517
Mean	10.463	4.690	7.577	10.201	3.098	6.650
F test	(L) **	(V) **	(L x V) **	(L) **	(V) **	(L x V) **
L.S.D.0.05%	0.051	0.077	0.107	0.325	0.251	0.373

The interaction between locations and rice varieties had a great effect on grain yield (t/ha) in both seasons, whereas, salinity conditions had negative effect on grain yield (t/ha) which decreased under saline soil (EL-Sriw) compared with that under normal soil (Sakha) for all genotypes. The highest values of grain yield (t/ha) were obtained by Sakha 101 and Sakha 178 in 2009 season and SK28-79-2-5-8-4 in 2010 season under Sakha location. On the contrary, the lowest values of grain yield (t/ha) were recorded by Sakha 103 rice variety under saline soil (EL-Sriw) in both seasons (Table 10). Under El-Sirw site, SK28-79-2-5-8-4, SK28-115-20-5-7-1 recorded the highest values in 2009 as well as Giza 178 and SK28-115-20-5-7-1 in 2010 season. This indicates that Sakha 103 is sensitive variety to salinity but, SK28-79-2-5-8-4 and SK28-115-20-5-7-1 varieties are tolerant to salinity. Thus, it could use SK28-79-2-5-8-4, SK28-115-20-5-7-1 and Giza 178 as a donor in breeding programs to transfer the genes responsible to salinity tolerant. The differences in grain yield among rice genotypes may be due to genetic background of the variety, environmental conditions and nature of soil. These results are in agreement with those reported by Mahmood *et al.* (1999), Zeyed (2002), Ali *et al.* (2004), Natarajan *et al.* (2005). Soltan (2006), Sakran (2007) and Mohamed (2010).

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تقييم بعض التراكيب الوراثية للارز تحت ظروف الاراضي العادية والملحية

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أجريت تجارب حقلية بالمزرعة البحثية لمركز البحوث والتدريب في الارز بسخا (محافظة كفر الشيخ) وكذلك بالسرو (محافظة دمياط) خلال موسمي ٢٠٠٩ ، ٢٠١٠م. تهدف الي مقارنة وتقييم مجموعة من التراكيب الوراثية للارز تحت ظروف الأراضي الملحية بالسرو والأراضي العادية بسخا. كانت الاصناف والتراكيب الوراثية المنزرعة في هذه الدراسة هي Giza 178, Giza 177, Sakha 104, Sakha 103, Sakha 105, GZ6296, GZ6903, SK28-79-2-5-8-4, SK28-115-20-5-7-1; Sakha 101 . استخدم في تنفيذ هذه التجارب تصميم القطاعات الكاملة العشوائية في ثلاث مكررات في كلا الموقعين (سخا والسرو). شملت المقارنة صفات طول النبات، مساحة ورقة العلم (سم^2)، طول فترة النمو (يوم)، عدد الداليات / الجورة، طول الدالية، عدد الحبوب الممتلئة بالدالية، وزن الألف حبة، محصول الحبوب (طن/هكتار). ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي:-

اظهرت النتائج ان ظروف الملوحة بمنطقة السرو اثرت سلبا ومعنويا علي صفات ارتفاع النبات، مساحة ورقة العلم، الفترة حتي النضج، عدد الداليات /الجورة، طول الدالية، عدد الحبوب الممتلئة /الدالية، وزن الالف حبة، حيث انخفضت هذه الصفات معنويا بمنطقة السرو مقارنة بالزراعة تحت الظروف الطبيعية بمنطقة سخا والتي نتج فيها أعلي محصول من الحبوب للهكتار في كلا الموسمين.

اختلفت الاصناف تحت الدراسة معنويا في الصفات المدروسة في كلا الموسمين. تفوق الصنف SK28-115-20-5-7-1 معنويا علي الاصناف الاخري في صفات ارتفاع النبات، مساحة ورقة العلم، عدد الداليات /الجورة، طول الدالية وكذلك عدد الحبوب الممتلئة /الدالية. بينما تفوق الصنف Giza 178 في صفات مساحة ورقة العلم، عدد الداليات /الجورة، وعدد الحبوب الممتلئة /الدالية. أعطي الصنف Giza 178 والصنف SK28-115-20-5-7-1 أعلي محصول حبوب للهكتار في الموسم الاول والثاني علي الترتيب.

كان للتفاعل بين المواقع والاصناف تأثيرا عالي المعنوية علي صفات خصائص النمو ومكونات المحصول وكذلك محصول الحبوب للهكتار في موسمي الدراسة. نتج اعلي محصول من الحبوب في كلا الموسمين عند زراعة الصنف Sakha 101 بمنطقة سخا، بينما انخفض محصول الحبوب معنويا للاصناف المنزرعة تحت ظروف الارض الملحية بمنطقة السرو. وبالرغم من ذلك سجل الصنف SK28-79-2-5-8-4 والصنف SK28-115-20-5-7-1 أعلي محصول حبوب للهكتار تحت ظروف الارض الملحية بالسرو في الموسم الاول والثاني علي الترتيب، مما يشير الي تحمل هذين الصنفين لظروف الاراضي الملحية.