J. Agric. Sci. Mansoura Univ., 32 (12): 10033 - 10046, 2007

ROLE OF SOME GROWTH SUBSTANCES (GA_3, KINETIN, SALICYLIC AND ASCORBIC ACID) IN ALLEVIATING THE HARMFUL EFFECTS OF SALINITY STRESS ON GROWTH AND YIELD OF RICE PLANT.

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ABSTRACT

Two field experiments were conducted during of 2005and 2006 seasons at Tag El-Ezz Research Station, Dakahlia Governorate, Egypt. The experiments aimed to study the effects of gibberellic acid, ,ascorbic acid, salicylic acid or kinetin for increasing the tolerance of rice plants grown in salin soils to find out the appropriate behavior of two rice cultivars under some growth substances and salinity conditions.The expermintal data show that salinity stress in saline soil depressed greatly all growth parameters as well as yield and its components of rice plant of the two rice cultivars.Sensitive rice cultivar was more affected by salinity stress than tolerant one.It could be concluded that applied growth substances(GA3,Kinten, Ascorbic acid and Salicylic acid) could partially mitigate or counter act the harmful effects of salinity stress on growth and yield of rice plant .It could be also show that GA3 and Salicylic acid were most effective in this respect.

INTRODUCTION

Rice is one of the main cereal crops in Egypt and all over the world. The productivity of rice like all crops, is ground by environmental conditions, especially soil properties, water supply, fertilizer use efficiency and others. However, several problems can cause a drop in the productivity of rice.

The average of rice productivity of the salt affected area in Egypt is much lower than that of normal soil which negatively affects the national yield average (El-Mowafi,1994).Rice is moderately susceptible to salinity (AKbar *et al*., 1975; Olass and Hoffman, 1977).

At higher ECe values the crop yields are reduced so drastically that crop cultivation is not economical without soil amendments. Addition of salts to water lowers its osmotic potential, resulting in decreased availability of water to root cells. Salt stress thus exposes the plant to secondary osmotic stress, which implies that all the physiological responses, which are invoked by drought stress, can also be observed in salt stress.

Other physiological and biochemical parameters associated with salinity and salt stress tolerance are accumulation of sugars, amino acids, inorganic ion and organic acids. The accumulation of compatible solutes which are non-toxic at higher concentration to cytoplasmic functions, allowing turgor maintenance and/or protection of macromolecular structures against the destabilizing effect of the decrease in water activity have also been reported in many species.

Sakr, (1996), indicated that salinity suppressed both cell division and cell enlargement proportionally in wheat plants. The reduction in plant growth under salinization may be also due to regulation between the endogenous Phytohormones present in the plants. (Ozdemir *et al.* 2004).

In addition, the inhibitory effect of salinity on growth may be due to decrease in water absorption, metabolic processes, merestematic activity and/or cell enlargement (Khadr, *et al,* 1994). Moreover the decrease in growth due to salinity may be attributed to an increase in respiration rate resulting from higher energy requirements (Yang, *et al.* (1990) reported that there are two ways that salinity could retard growth(a) by damaging growth cells so that they can not perform their functions or (b-) by limiting their supply of essential metabolites, the reduction in plant growth under salinization may be also due to the regulation between the endogenous growth substances presented in the seedlings (El-Nabarawy, 1994). Regarding seedling fresh weight El-Bahrany, (1994) attributed the depressing effects of salinity on plant growth to an inhibition on protein turnover and nucleic acid synthesis in plants.

Role of cellular antioxidant system in relation to water and/or temperature stress tolerance has been reported by many workers. Some work has also been reported on the generation of ROS and plant antioxidant in relation to salinity stress. However, the work regarding the comparative role of plant antioxidant systems, osmolytes and accumulation of toxic and useful ions in relation to salinity stress tolerance in grain crops is limited (Sairam et al,2002)

Application of some growth regulators has been extensively used plants. Plant growth regulators (GA3, ascorbic acid, salicylic acid and kinetin) are widely applied to agricultural crop as means of crop improvement. These regulators protect plant from various stresses (Li *et al* 1998).

Regarding the effect of antioxidant on rice under salinity stress ;it could be mention that, exogenous ascorbic acid had an inhibitory effect on lipid peroxidation in some plants seedlings exposed to osmotically induced water-stress . Ascorbate may also be involved in regulation the cell cycle (Kerk and Feldman 1995).

Shalata and Neumann (2001), found that ascorbic acid acts directly to neutralize superoxide radicals, singlet oxygen or superoxide and as a secondary anti-oxidant during reductive recycling of the oxidized form of α-tocopherol, another lipophilic anti-oxidant molecule (Noctor and Foyer, 1998). There appear to have been no quantitative investigations of the effects of an additional supply of ascorbic acid on plant resistance to severe salt stress.his envistigation aimed to increase rice tolerance grown under saline soils by using GA3,Kinetin,Ascorbic or Salicylic acid.

MATERIALS AND METHODS

Two field experiments were conducted during of 2005and 2006 seasons at Tag El-Ezz Research Station, Dakahlia Governorate, Egypt. The experiments aimed to study the effects of gibberellic acid, ,ascorbic acid, salicylic acid or kinetin for increasing the tolerance of rice plants to high levels of salts to find out the appropriate behavior of two rice cultivars under some growth substances and salinity conditions.

The permanent field was well prepared through a good ploughing and leveling. Calcium super phosphate at the rate of 100 Kg /fed, was applied before ploughing.

Urea (46.5%) at the rate of 69 kg N/fed, were examined as a source of N. The N- fertilizer was applied as three equal splitting dose . The first dose was added before the last harrowing irrigation , the second dose was applied 20 days after transplanting and last third was applied 45 days after transplanting.

Salinity levels:

The rice varieties (Giza 177 & Giza 178) were transplanted and grown in two areas different in its salinity level. The first area was (Ec =3ds/m) while the second area was (Ec= 9.3 ds/m).

Experimental design:

A split-split plot design with four replications was used. The main plots were devoted for varieties and the sub-plots designed for salinity, and sub-sub split received growth substances.

In the field rice plant varieties (Giza 177 , Giza 178) were sprayed twice after 35 and 50 days from sowing with either of:

1-Tap water (control). 2- GA_3 (500mg/l). 3-ascorbic acid(100mg/l)

4-salicylic acid(100mg/l). 5- Kinetin(20mg/l)

Each of both planted areas contains 5 treatments as mentioned before

Sampling dates :Two samples were taken throughout the experimental period during the vegetative growth stage, i. e. 45 and 60 days after sowing in the two growing seasons of pot and field expermints.

At each sampling date, the following growth and yield parameters were recorded .

Number of tillers per plant, leaf dry weight gm per plant,stem dry weight gm per plant,leaf area index .

At harvesting date yield parameters were recorded as follows:1. Number of panicles / plant. 3- Number of filled grains /panicle. 4- Number of unfilled grains/panicle. 5- Panicle dry weight (gm)/plant. 7- Grain yield gm/ plant.

Statistical analysis: The dates of all experiments were statistically analyzed as technique of the analysis of variance (ANOVA) according to Gomez and Gomez (1984). The treatment means were compared using the least significant differences (LSD).

RESULTS

a- Growth characters:

Number of tillers/plant;

Data in table (1) shows that GA_3, ascorbic acid, salicylic acid or kinetin as well as their combinations with salinity stress caused an increasing effect in tillers number of different rice cultivars throughout the experimental season. GA_3 and salicylic were most effective in this respect.

On the other hand salinity stress alone decreased tillers number.

Table (1): number of tillers/hill of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var. (Giza 177)			Salt tol. Var. (Giza 178)		
	1st sampling date tillering stage (45 day from sowing)					
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	17.0	13.0	15.0	17.0	15.0	16.0
GA3	22.0	21.0	21.5	22.0	21.0	21.5
Ascorbic	20.0	20.0	20.0	20.0	19.0	19.5
Salicylic	21.0	22.0	21.5	21.0	21.0	21.0
Kinetin	21.0	19.0	20.0	20.0	20.0	20.0
Mean	20.2	19.1	19.6	20.0	19.2	19.6
LSD 5%	S= 0.15 Var = 0.94 GS = 0.94 S x Var x GS=					
2nd Sampling date before panicle initiation (60 days from sowing)						
Control	20.0	18.0	19.0	22.0	19.0	20.5
GA3	25.0	24.0	24.5	26.0	24.0	25.0
Ascorbic	23.0	23.0	23.0	23.0	22.0	22.5
Salicylic	24.0	24.0	24.0	25.0	23.0	24.0
Kinetin	24.0	23.0	23.5	24.0	23.0	23.5
Mean	23.2	22.4	22.8	24.0	22.2	23.1
LSD 5%	S= 0.15 Var = 0.75 GS = 0.94 S x Var x GS=					

Stem dry weight:

Data in table (2) shows that salinity stress level (saline soil), decreased the accumulation dry weight of rice stem of different cultivars with regard to normal soil throughout the experimental season. On the other hand the data show that any of applied growth substances alone or combined with salinity stress level increased stems dry weight of the two rice cultivars.

Table (2): Average stem dry weight (gm)/plant of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var. (Giza 177)			Salt tol. Var. (Giza 178)		
	1st sampling date tillering stage (45 day from sowing)					
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	8.5	7.0	7.75	8.4	8.1	8.25
GA3	11.0	9.7	10.35	11.4	10.6	11.0
Ascorbic	10.0	9.2	9.6	10.0	9.5	9.75
Salicylic	10.7	9.6	10.15	10.7	10.3	10.5
Kinetin	10.5	8.8	9.65	10.3	10.1	10.2
Mean	10.14	8.86	9.5	10.16	9.7	9.94
LSD 5%	S= 0. 03 Var = 0. 04 GS = 0. 02 S x Var x GS=					
2nd Sampling date before panicle initiation (60 days from sowing)						
Control GA3 Ascorbic Salicylic Kinetin	14.4 18.0 16.8 17.4	12.3 17.1 16.0 16.7	13.35 17.55 16.4 17.05	14.3 19.0 16.7 18.01 17.0	13.8 17.5 16.2 17.0 16.6	14.05 18.25 16.45 17.51 16.8
Mean	16.7	15.68	16.2	17.00	16.22	16.61
LSD 5%	S= 0.03 Var = 0.03 GS = 0.04 S x Var x GS=					

Moreover, the treatment rice cultivar (Giza 178) was more effective in this respect.

Generally, growth substances used were more effective in counteracting the harmful effect of salinity stress .

Leaves dry weight(gm):

Data in table (3) indicated that the growth substances used GA_3, ascorbic acid, salicylic acid or kinetin increased and their combinations with salinity stress level while high salinity level (saline soil) alone decreased the accumulation dry matter of leaves through out the two rice cultivars used with regard to normal soil .Moreover, GA_3 and salicylic acid treatments were most effective in increasing leaves dry weight under saline soil and normal soil of the different rice cultivars.

It could be mention that the sensitive and tolerance cultivars were more response to the treatments.

Table (3): Average leave dry weight (gm)/plant of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var. (Giza 177)			Salt tol. Var. (Giza 178)		
	1st sampling date tillering stage (45 day from sowing)					
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	6.5	4.6	5.55	6.1	6.0	6.05
GA3	8.2	6.9	7.55	8.6	7.8	8.2
Ascorbic	7.4	5.8	6.6	7.8	7.1	7.45
Salicylic	7.9	6.1	7.0	8.1	7.7	7.9
Kinetin	7.8	5.6	6.7	7.9	7.4	7.65
Mean	7.56	5.8	6.68	7.7	7.2	7.54
LSD 5%	S= 0.24 Var = 0.0003 GS = 0.014 S x Var x GS=					
	2nd Sampling date before panicle initiation (60 days from sowing)					
Control	12.2	11.9	12.05	14.1	11.4	12.75
GA3	14.9	15.0	14.95	16.7	14.2	15.45
Ascorbic	13.8	13.8	13.8	13.6	13.0	13.3
Salicylic	14.5	14.4	14.45	15.3	13.9	14.6
Kinetin	14.4	14.2	14.3	11.7	13.6	12.65
Mean	13.96	13.86	13.91	14.28	13.22	13.75
LSD 5%	S= 0.035 Var = 0.035 GS = 0.053 S x Var x GS=					

Leaf area index:

.Data in table (4) show the effect of growth substances used (GA_3, ascorbic acid, salicylic acid & kinetin) on leaf area index of rice plant cultivars under saline soil. Data shows that leaf area index decreased due to saline soil treatments through out the two sampling dates (45 and 60 from sowing). Rice plants treated with applied growth substances used showed a slight increase in leaf area index. Salicylic acid treatment was the most effective in this respect. In addition applied GA_3 or salicylic acid combined with saline soil increased leaf area index. Data in the same table show also that growth substances used enhanced rice leaf area index under salinity stress conditions. This may be due to the counteracting effect of these treatments on the harmful effect of different salinity levels.

Table (4): Average leaf area index of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var. (Giza 177)			Salt tol. Var. (Giza 178)		
	1st sampling date tillering stage (45 day from sowing)					
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	3.4	3.0	3.2	3.5	3.1	3.3
GA3	3.9	3.5	3.7	4.0	3.8	3.9
Ascorbic	3.6	3.4	3.5	3.7	3.6	3.65
Salicylic acid	3.9	3.6	3.75	4.2	3.9	4.05
Kinetin	3.5	3.4	3.45	3.6	3.5	3.55
Mean	3.66	3.38	3.52	3.8	3.58	3.69
LSD 5%	S= 0.025 Var = 0.020 GS = 0.032 S x Var x GS=					
2nd Sampling date before panicle initiation (60 days from sowing)						
Control	4.0	3.7	3.85	4.3	4.1	4.2
GA3	4.6	4.3	4.45	4.8	4.4	4.6
Ascorbic	4.2	4.0	4.1	4.5	4.3	4.4
Salicylic	4.8	4.4	4.6	5.0	4.7	4.85
Kinetin	4.3	4.1	4.2	4.6	4.2	4.4
Mean	4.38	4.1	4.24	4.64	4.34	4.49
LSD 5%	S= 0.07 Var = 0.06 GS = 0.07 S x Var x GS=					

Leaf area ratio:

Data in table (5) show the effect of growth substances used (GA_3, ascorbic acid, salicylic acid and kinetin) on leaf area ratio of rice plant cultivars under normal and saline soil stress .The data shows that salinity stress levels alone or combined with any of applied growth substances decreased while applied growth substances alone increased leaf area ratio in two cultivars used (sensitive and tolerance) in the two sampling dates.

Table (5): Average leaf area ratio of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var.(Giza177)			Salt tol. Var. (Giza 178)		
	1st sampling date tillering stage (45 day from sowing)					
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	150.5	115.4	132.95	147.0	116.8	131.9
GA3	164.4	129.8	147.1	169.5	136.4	152.95
Ascorbic	155.5	126.7	141.1	165.4	133.0	149.2
Salicylic	162.5	130.2	146.35	169.0	135.0	152.0
Kinetin	153.4	125.0	139.2	150.0	126.2	138.1
Mean	157.26	125.42	141.34	160.18	129.48	144.83
LSD 5%	S= 0.07 Var = 0.06 GS = 0.07 S x Var x GS=					
2nd Sampling date before panicle initiation (60 days from sowing)						
Control	133.4	108.3	120.85	138.5	140	139.25
GA3	145.2	118.4	131.8	150.2	125.3	137.75
Ascorbic	140.5	115.2	127.85	145.4	119.5	132.45
Salicylic	143.6	117.5	130.55	149.6	122.4	136
Kinetin	141.3	116.0	128.65	145.5	120.2	132.85
Mean	140	116.0	128.65	145.84	125.48	135.66
LSD 5%	S= 0.054 Var = 0.060 GS = 0.0054 S x Var x GS=					

GA_3 and salicylic alone or combined with saline stress were more enhanced leaf area ratio of plant rice in all cultivars. growth substances partially counteracted the harmful effect of salinity on leaf area ratio through out the two sampling dates.

Yield and its components:

-Number of panicles/ plant:

Data in table (6)shows that number of panicles/plant decreased due to salinity stress treatments alone or combined with any of applied growth substances through out the cultivars used.

Data in the same table show also that separated applied growth substances (GA_3,ascorbic acid, salicylic acid or kinetin), treatments increased number of panicals per plant. They also counteracted harmful effect of salinity stress. The rice varieties used affected by the different treatments used under salinity stress. The most effective treatment in this respect is salicylic acid treatment .

Table (6): Average number of panicles/plant of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mgl) / Growth substances	Salt sensitive Var. (Giza 177)			Salt tol. Var. (Giza 178)		
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	20.20	15.10	17.65	25.02	21.00	23.01
GA3	22.48	19.23	20.86	25.93	21.84	23.89
Ascorbic	21.93	18.60	20.27	25.50	21.61	23.56
Salicylic	23.70	20.45	22.08	26.95	23.28	25.12
Kinetin	22.12	18.92	20.52	25.53	21.55	23.54
Mean	22.09	18.46	20.28	25.79	21.86	23.83
LSD 5%	S= 0.015 Var = 0.078 GS = 0.094 S x Var x GS=					

Panicle Weight (gm):

Data in table(7)shows that salinity stress decreased panicle weight of different rice cultivars as compared with normal soil. It was clearly that the sensitive rice cultivar has more affected while the tolerance cultivars had less affected to salinity stress. Growth substances (GA_3,ascorbic acid, salicylic acid and kinetin) increased panicle weight of the different rice cultivars in the normal and saline soil.

Moreover, salicylic acid treatment was the most effective in this respect on all cultivars used .

Table (7): Average panicle weight(gm) of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var.(Giza 177)			Salt tol. Var. (Giza 178)		
	Normal soil	**Saline soil**	**M**	**Normal soil**	**Saline soil**	**M**
Control	3.30	2.72	3.01	3.65	3.40	3.52
GA3	3.59	2.86	3.22	3.71	3.46	3.58
Ascorbic	3.58	2.80	3.19	3.69	3.45	3.57
Salicylic	3.62	2.94	3.28	3.77	3.55	3.66
Kinetin	3.58	2.79	3.18	3.70	3.45	3.57
Mean	3.55	2.83	3.19	3.70	3.46	3.58
LSD 5%	S= 0.02 Var = 0.05 GS = 0.09 S x Var x GS=					

Unfilled grains / panicle:

Date show in table (8) that applied GA_3, ascorbic acid, salicylic acid or kinetin decreased unfilled grains of rice panicle in the different rice cultivars.

On the other hand, salinity stress levels (saline soil) increased unfilled grains of panicle in sensitive cultivar more than tolerant cultivar . The interaction treatments of salinity levels with growth substances had significant effect in this respect. The different rice cultivars gave different significant responses to salinity levels or growth substances used **.**

Table (8): Average Number of unfilled grain/panicle of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var.(Giza 177)			Salt tol. Var. (Giza 178)		
	Normal soil	**Saline soil**	**M**	**Normal soil**	**Saline soil**	**M**
Control	16.20	24.15	20.175	14.30	18.20	16.25
GA3	14.92	20.40	17.66	13.65	16.10	14.875
Ascorbic	14.80	21.60	18.20	13.90	16.60	15.25
Salicylic	13.50	20.00	16.75	13.90	16.60	15.25
Kinetin	14.70	22.0	18.35	14.00	16.80	15.40
Mean	14.824	21.63	18.227	13.95	16.86	15.40
LSD 5%	S= 0.04 Var = 0.05 GS = 0.04 S x Var x GS=					

Number of Filled grains /panicle:

Data in table(9) show that salinity stress used (saline soil) decreased while growth substances increased filled grains of panicle in the different rice cultivars sowing. The rice cultivars showed significant differences between them in response to salinity stress. The interaction treatments of salinity stress with growth substances had significant response in this respect. Salicylic acid was the most effective in the different rice cultivars used in this respect .The Salt sensitive rice (Giza 177) was the most effective in this respect compared with to cultivar tolerance(Giza 178).

Table (9): Average number of filled grain/panicle of rice cultivars treated by growth substances under saline soil (combined analysis of the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var.(Giza 177)			Salt tol. Var. (Giza 178)		
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	142.8	75.2	109.0	170.3	135.9	153.1
GA3	153.6	89.4	121.5	175.4	139.0	157.2
Ascorbic	150.4	87.3	118.8	173.1	138.9	156.0
Salicylic	159.8	94.2	127.0	179.2	143.3	161.2
Kinetin	145.2	85.7	115.4	173.2	138.0	155.6
Mean	150.4	86.4	118.4	174.3	139.00	156.6
LSD 5%	S= 0.07 Var = 0.06 GS = 0.07 S x Var x GS=					

Grain yield (gm) / plant:

Data in table (10) show that salinity stress used decreased while growth substances increased grains yield/plant in the different rice cultivars. The rice cultivars showed significant differences between them in response to salinity stress. It is evident that Giza 178 produced the highest grain yield / plant while Giza 177 produced the lowest grain yield /plant .The interaction treatments of salinity stress levels with growth substances had significant response in this respect. Salicylic acid treatment was the most effective in increased grains yield/plant in the two rice cultivars .

Table (10): Average grain yield (gm)/plant of rice cultivars treated by growth substances under saline soil (combined analysis f the growing seasons).

Salinity (mg/l) / Growth substances	Salt sensitive Var.(Giza 177)			Salt tol. Var. (Giza 178)		
	Normal soil	Saline soil	M	Normal soil	Saline soil	M
Control	33.20	22.85	28.03	42.08	36.12	39.10
GA3	35.25	28.57	31.91	43.65	37.52	40.59
Ascorbic	34.42	28.00	31.21	43.00	37.10	40.05
Salicylic	37.23	29.43	33.33	45.30	39.97	42.63
Kinetin	34.64	27.62	31.13	42.96	37.00	39.98
Mean	34.95	27.29	31.12	43.38	37.54	40.46
LSD 5%	S= 0. 19 Var = 0.25 GS = 0.17 S x Var x GS=					

DISCUSSION

Effect of salinity stress on:

Growth

The inhibitory effect of salinity on growth of wheat plant in our reaults may be due to decrease in water absorption, metabolic processes, merestematic activity and/or cell enlargement (Khadr, *et al.* 1994 and Sakr,1996). Moreover, the decrease in growth due to salinity may be attributed to an increase in respiration rate resulting from higher energy requirements. Yang, *et al.* 1990, reported that there are two ways that salinity could retard growth (a) by damaging growth cells so that they can not perform their functions or (b) by limiting their supply of essential metabolites.

NaCl has been shown to bring about a reduction in the overall growth and productivity of plants by perturbing the functioning of vital components of photosynthesis like PSI, PSII and Rubisco [Chen & Murata 2002].

Yield and its components:

Salinity affects all stages of wheat growth and development, as well as yield of plants. The yield is much more depressed by salt than is vegetative growth. The reduction in seed yield is largely due to a decrease in seed set in the fruit, which may be attributed to a decrease in the viability of pollen or in the receptivity of the stigmatic surface or both, (Sakr, *et al.* 2004).

The reduction in seed yield is largely due to (1) a reduction in seed set in the fruit that may be attribute to a decrease in the viability of pollen and/or in the receptivity of the stigmatic surface. The reduction in pollen viability has been related to decreased calcium mobilization from plant leaves treated with sodium chloride, which is important in pollen germination and pollen tube growth. (2) also, the significance reduction in fruit number due to substantial abscission of flowers or young fruit due to ethylene induction by salinity. Factor affecting cell division and cell expansion, such as tissue water status and the concentration of certain plant hormones, i.e. ABA are involved in the regulation fruit of set under stress. (3) moreover, revealed that increasing salinity levels decreased significantly yield due to the decreasing production pollen grain, mean number of perfect flowers, and fruit set. (4) the depression effect of salinity on yield may be due to decreasing the leaf area and number per plant, resulting reduction in the supply of carbon assimilate due to decreasing the net photosynthetic rate and biomass accumulation. (5) it can be proposed that the several detrimental effects attributed to salinity stress on most of the studies growth characters and yield might be partially due to decreases in nitrogen concentration (Sakr et al,2007).

Role of growth substances in counteracting the harmful effect of salinity stress.

Asfore, ascorbic ,it could be cocluded that, these plant antioxidants can alleviate the harmfull effect of ROS may be through several ways such as :
(1) inhibits the lipid photoperoxidation (Michalski and Kaniuga, 1981). (2) is involved in both electron transport of PS II and antioxidizing system of chloroplasts. (McKersie, 1996). (3), as membrane stabilisers and multifaceted antioxidants, that scavenge oxygen free radicals, lipid peroxy radicals, and singlet oxygen (Diplock *et al*., 1989). (4) can react with peroxyl radicals formed in the bilayer as they diffuse to the aqueous phase. (Hess, 1993). (5) . It scavenges cytotoxic H_2O_2, and reacts non-enzymatically with other ROS: singlet oxygen, superoxide radical and hydroxyl radical (Larson,

1988).(6) regenerate another powerful water-soluble antioxidant, ascorbic acid, via the ascorbate–glutathione cycle.

(Blokhina, *et al.* 2002). (7) stabilize membrane structures (Blokhina, 2002). (8) modulates membrane fluidity in a similar manner to cholesterol, and also membrane permeability to small ions and molecules (Foyer, 1992). (9) to decrease the permeability of digalactosyldiacylglycerol vesicles for glucose and protons (Berglund, *et al*., 1999).

As for salicylic acid,t he increased water potential values in SA pre-treated samples under ionic stress suggest that accumulation of inorganic or organic osmolytes makes the surplus of water uptake possible as it can also be seen from the increased relative water contents of tissues Szepesi, *et al.* (2005) .

SA decreased the Na+/K+ ratio in the roots and increased it significantly in the leaves. Na+, accumulated in the leaf tissues, functioned as an inorganic osmolyte, and resulted in an increased water potential and water content.

Since SA improved the photosynthetic performance of plants under stress conditions (Ananieva, *et al*. 2002), and chlorophyll a fluorescence could give insight into the ability of a plant to tolerate environmental stresses, .these results suggests that SA-pre-treatment may improve the gross rate of carbon assimilation during osmotic stress.

Sakhabutdinova, *et al.* (2003), in the presence of SA the leaves accumulated different compatible osmolytes, such as sugars, sugar alcohol and proline. superoxide dismutase (SOD), peroxidase (POD), ascorbate peroxidase (APX) and glutathione reductase (GR) exhibited different changes at 10-7 M SA or 10-4 M SA.

As for GA3 and Kinetin it could be mention that ;Plant growth substances such as GA3 and Kinetin counteracting the deleterious effects of salinity on plant growth and yield by increasing succulence in plant due to the increase in cell number and elongation, tends to dilute the internal ionic concentration (Ismail, 2003). In addition, it may induce the cambium differentiation to yield xylem and phloem tissue which improved the absorption and conducting water to the growing organs, and improved the translocation of photo-assimilate thus increased plant growth and yield.

Under stress conditions, excess reactive oxygen species attack lipids, proteins, and nucleic acid. This results in lipid peroxidation, protein inactivation, and DNA alteration. It has also been reported that plants with high levels of antioxidants, whether constitutive or induced, have a greater resistance to such oxidative damage. Results of this study presented in our data show that the primary components of this system include carotenoids, ascorbate, soluble sugars, total phenols and proline contents as well as peroxidase activity were enhanced with exogenous application of plant growth substances.

In addition, Schwarz and Gale (1981), Imanul Huq and Lather (1983), Sakr (1996) and Naidu et al., (2000) reported that the role of growth substances (kinetin, GA_3, IAA and ethrel) on overcoming the depressing effect of salinity stress on growth and biochemical constituents may be due to one or more of the following: (a)- Increase root dry weight and decreasing root resistance to water flow and Cl- uptake. (b)- Nullifying the changes on mineral composition, photosynthetic pigments and endogenous hormonal levels. (c)- Increasing water absorption capacity of the roots. (d)- Increasing K^+ uptake and sugars accumulation within the plant tissues as well as oligosaccharides contents. (e)- Increasing water status within the plant tissues by sustaining the determined metabolite level including selective K^+ over Na^+, increasing organic acids contents and ion uptake. (f)- Increasing stimulators/inhibitors ratio in the plant tissues. (g)- Increasing carbohydrates, proline, organic acids which can used as an indicator in the osmoregulation of tissues under salinity stress.

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دور بعض مواد النمو(الجبريلين-الكينيتين-السالسيليك-الأسكوربيك) فى التغلب على الآثار الضارة المتسببة عن الاجهاد الملحى على النمو والمحصول لنبات الأرز

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**** مركز بحوث الأرز – سخا- مركز البحوث الزراعية**

أجريت تجربتان حقليتان فى محطة بحوث تاج العز بالدقهلية عامى 2005.2006 بغرض دراسة تأثير كل من الجبريلين- الأسكوربيك- السالسيليك – الكينيتين لزيادة مقاومة نباتات الأرز المنزرعة فى الأراضى الملحية ودراسة سلوكيات أصناف الأرز واستجاباتها لأي من مواد النمو أو ظروف الأجهاد الملحى . لوحظ نقص واضح فى كل صفات النمو والمحصول ومكوناتة لكل الصنف الأرز الحساس والمقاوم . كما أن استجابة الصنف الحساس للملوحة كان بدرجة أعلا من الصنف المقاوم.

إجمالا يمكن القول أن مواد النمو المستخدمة (الجبريلين، الكينيتين، الأسكوربيك و السالسيليك) يمكنها التغلب جزئيا على التأثيرات الناجمة عن الاجهاد الملحى على نمو محصول نباتات الأرز وكان الجبريلين و السالسيليك هو الأكثر تأثيرا فى هذا الشأن.