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Research Article

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Effect of soil salinity on growth parameters and antioxidant activity in two genotypes of eggplant (*Solanum melongena* L.)

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ABSTRACT
In many tropical, subtropical, and Mediterranean countries, eggplant (*Solanum melongena* L.) is a traditional vegetable crop. Its yield loss is caused by abiotic stress such as soil and water salinity. The main aim of this study was to investigate the salt tolerance potential of selected genotypes at the early stage (germination and seedling) of plant growth. To identify the stable source, 30 accessions of eggplant (*Solanum melongena* L.) were screened. Two genotypes [IC354140 (GT25); IC 354562 (GT26)] had the highest seed germination (90-100%) among the 30 genotypes studied. As a result, these two eggplant genotypes were chosen for further research. GT25 and GT26 seedlings were treated with various salt concentrations when they were 30 days old (0, 25mM, 50mM, 75mM, 100mM, 125mM, 150mM). The data of the present study revealed that germination percentage reduced significantly (35%) in GT26 compared to GT25 with increasing levels of salinity (EC, pH). Eggplant seedling length, dry and fresh weight of radicle and hypocotyls, the number of leaves decreased with increasing soil pH and increasing soil EC ($P < 0.001$). With increasing salt, the overall chlorophyll and flavonoid contents gradually dropped. SOD and POD antioxidant were increased with salt stress. The stability of the Eggplant (biomass production) and the quality of the leaves are both affected by soil salinity (antioxidant compounds).
Keywords: Salinity stress, Chllorophyll, Flavanoid, Chlorogenic acid, Antioxidant activity.

INTRODUCTION

Worldwide, soil salinity and sodicity are two key environmental factors that limit plant development and output. The annual rate of loss of agricultural lands due to salinization is estimated to be over 1.5 million hectares; thus far, soil salinity and sodicity have deteriorated around 77 million hectares of agricultural areas (Eynard et al., 2006). Saline soil is one with exchangeable sodium of 15% and electric conductivity (EC) of the saturation extract (ECe) in the root zone that surpasses 4 dS m-1 (about 40 Mm NaCl) at 25 ºC. At this ECe, the yields of most crop plants are lowered, but the yields of numerous crops are reduced at lower ECes (Munns, 2005; Jamil et al., 2011). High salinity affects 20 percent of total cultivated and 33 percent of irrigated agricultural lands worldwide, according to estimates. Plant growth is known to be slowed in salt-stressed soils (Paul, 2012). Vegetable germination (Nerson & Paris 1984; Akinci 1999), growth (Chartzoulakis 1992; Mendlinger & Pasternak 1992), fruit set (Meiri et al., 1982; Hall 1983), and yield (Meiri et al., 1982; Hall 1983) are all affected by salinity (Gough & Hobson 1990; Adams 1991; Graifenberg et al., 1996). Salinity levels range from 1 to 50 dS m-1 (Siadat et al., 1997). Salinity and sodicity can inhibit plant growth by causing ion toxicity (primarily Na+ and Cl) and osmotic stress (Borsani et al., 2001; Eraslan et al., 2007; Tarakcioglu and In al., 2002), but they can also reduce productivity by altering ionic relations and when combined with pH changes (sodic soils have a higher pH), nutritional imbalance (Borsani et (Caines and Shennan, 1999).

Knowledge of vegetable plant salt tolerance is critical for management decisions and, as a result, for increased profitability (Shannon 1980; Jones 1987; Kalloo & Bergh 1993). The levels of salt tolerance of varieties and species can be determined using a variety of parameters. Plants stressed by harsh climatic circumstances develop Reactive Oxygen Species (ROS), which cause cellular damage and are implicated in a variety of plant diseases (Abdi and Ali, 1999). It's thought that increased secondary metabolite synthesis in response to stress protects cellular structures against oxidation (Chanwitheesuk et al., 2005). It has been demonstrated that when plants are exposed to harsh environmental circumstances, the number of antioxidants and antibacterial components in their tissues increases (Maisuthisakul et al., 2007). Polyphenol components increase in plants as a result of biotic and abiotic stresses such as salt (Dixon and Palva, 1995). Caffeoylquinic acid derivatives like Chlorogenic acid and flavonoids like luteolin glycosides are primarily responsible for caffeoylquinic acid derivatives like Chlorogenic acid

and flavonoids like luteolin glycosides' antioxidant activity in phenolic compounds (Gebhardt and Fausel, 1997; Brown and Evans, 1998). The effect of salinity on the antioxidant accumulation in plant tissues has been demonstrated by numerous researches.

Eggplant (Solanum melongena) is somewhat sensitive to salinity, however, in the agricultural production of eggplant and its variants, more attention to salinity is required. To boost the production and profitability of crops irrigated with saline wastewaters, it is vital to understand salt tolerance in vegetable plants. The main aim of the present study was to investigate the effect of salinity on the stability of Eggplant (biomass production) and the quality of leaves (antioxidant compounds) to evaluate the potential of Egg Plant cultivation in this type of area.

MATERIALS AND METHODS

Soil and water analysis

Soil and water analysis is done from Central Laboratory for Soil and Plant Analysis, Division of Soil Science and Agricultural Chemistry, ICAR-Indian Agricultural Research Institute, New Delhi 110012

Normal tap water (from School of Biotechnology, Gautam Buddha University) and Soil samples (7-8 replicates of soil samples collected from the different sites of the University mixed properly before the analysis) were tested for the following physical parameters like pH, conductivity, Na+, K+, Na/K ratio, and phosphorus ions concentration. Soil pH measured by pH meter by 1:2 soil-water suspension method, Soil Electrical conductivity (EC) by using EC meter, Na+ and K+ analysis by ammonium acetate method using flame photometry (Systronics 128) and Phosphorus analysis by Olsen's method (1954) using spectrophotometer (T-80 UV/VIS spectrophotometer, PG Instruments LTD).

Soil EC and pH sample: First take the soil from the field, keep for air dry 1-2 weeks, crushed in mortar pestle sieved through 2mm, weight 10g soil, add 20 ml water, stir well and keep for half-hour to settle (minerals), then make standard using (KCl) for EC meter. Potassium chloride oven dry in paper-24 hour /overnight. pH calibration buffer (4, 7, 9.2, pH) 7, 4, 9.2 calibration (tablet buffer) dissolved.

Soil Na and K sample: Weigh 5g soil sample in 100ml conical flask (1: 5 ratio). Add 25 ml of 1N Ammonium Acetate (pH-7.0). keep for shaking on a shaker (5-10 minutes) after that filter. 1N ammonium acetate 77.08g-1000ml. Adjust pH with glacial acetic acid or ammonium solution. (800 ml ddw + 57 ml glacial acetic acid + 68 ml of Ammonium solution) Ph adjusts 7. Standard mineral K=1.908 of AR (KCl) potassium chloride dry in the oven for 2 hours and dissolved in 1-liter DDW.

Plant material

During the 2018-19 growing season, thirty eggplants (*Solanum melongena* L.) genotypes were employed as experimental material for salt tolerance testing at the germination and early seedling growth stages. The Germplasm Exchange Division, National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Pusa Campus, New Delhi, provided seeds for all genotypes.

Germination experiments

In the germination studies, thirty healthy and similar-sized seeds of each genotype were placed in petri dishes, with each dish serving as a replication. The seeds were rinsed in distilled water that had been sterilized. These seeds were placed in sterile Petri plates with two layers of filter paper that had been soaked with 10 ml of treatment solution. The salinity levels of the treatments were 0, 25, 50, 75, 100, 125, and 150 mM NaCl (tap water/control). Irrigation with such test solutions was employed to exert stress on different genotypes of eggplants. The control treatment was without sodium chloride. Seeds were allowed to germinate at 25±1°C in the dark and on the 4th day of the experiment, the germination percentage of all the genotypes was measured. For the seedling experiment, the best genotypes were chosen based on germination percentage.

Seedling experiments

Plants were grown in the field of Gautam Buddha University, at a mean air temperature of 30/25 ± 3°C (day/ night). Seeds of the chosen genotype were placed in a seedling container with the following dimensions 35×35×15 cm, filled with standard soil: a mixture of farm manure (2:1). The seedlings were watered with tap water until they reached the three-four leaf stage (30 days), then with solutions (50 ml per pot) of 0, 50, 100, and 150 mM NaCl made in tap water every two or three days for the remaining 30 days. A completely randomized block with three replications was used in the experiment. On the 60th day, seedlings were taken and washed with distilled water (125 and 150 mM NaCl administration demonstrated stress effects on seedling growth) and growth and physiological characteristics were assessed.

Plant Growth and Physiological Parameters

Seedling plantlets (a total of 60 days old) were harvested after 30 days of stress for growth and physiological parameter analysis. The leaves samples for chlorophyll Chlorogenic acid, flavanoid contents were collected from the second fully expanded fresh leaf from the top during the growth stage. All of the results were the average of three replications. The administration of test solutions containing 125 mM and 150 mM NaCl had a stressful effect on seedling development.

Chlorophyll contents

Methods for determining the amount of chlorophyll were used (Arnon, 1949). All treatments were chosen at random from 60-day-old leaves of plucked seedlings of both genotypes. 0.5 gm of fresh leaf tissue was measured and chopped into little pieces in the laboratory and placed in a specimen vial. 10ml of 80% acetone was added and the set up kept in the dark for 3 hours for chlorophyll to be extracted by the acetone. The amount of chlorophyll a and b, as well as the total chlorophyll in

the leaf tissue, were determined by measuring the absorbance of the chlorophyll solution using a spectrophotometer at 645 and 663 nm. Using Arnon's (1949) formula, the respective chlorophyll content in milligrams of chlorophyll per gram of leaf sampled was estimated as follows:

[12.7(A663) - 2.69(A645)] × V 1000 × W Chlorophyll a (mg g fwt.) –

Chlorophyll b (mg g fwt.) -1 = [20.2 (A645 + 8.02 (A663)] × V 1000 × W

Total Chlorophyll (mg g fwt.) -1 = [20.2 (A645 + 4.02 (A663)] × V 1000 × W

Where, A = Optical density at respective wave length (nm); V = Final volume of chlorophyll extract in 80% acetone; W = Fresh weight of the tissue extract

Total Flavonoids Content

Sample Preparation for TFC: The sample extract of the leaf (500mg) was dissolved in 10 ml methanol (solvent) and stored at room temperature. Infusions were filtered through Whatman No. 1 filter paper after 24 hours, and the residue was extracted again with the same volume of solvents. After 48 h, the process was repeated. Using a hot plate, combined supernatants were evaporated to dryness under vacuum at 40°C. The obtained extracts were stored in a refrigerator at 4°C in an amber bottle for analysis. The total flavonoid content of the samples was determined using the aluminum chloride colorimetric technique (Marinovaet al., 2005; Chang et al., 2002; Pourmorad et al., 2006; Miliauskas et al., 2004). For total flavonoid determination, rutin was used to make the standard calibration curve. Stock rutin solution was prepared by dissolving 1.0 mg rutin in 10 mL methanol, then the standard solutions of rutin (6.25, 12.5, 25, 50, 80 g/ml) were prepared by serial dilutions using methanol. Separately, 0.6 mL of diluted standard rutin solution and 0.6 mL of 10% aluminum chloride were combined. After mixing, the solution was kept at room temperature for 60 minutes. The absorbance of the reaction mixtures was measured against blank at 415 nm wavelength with a UV/Visible Spectrophotometer (Thermo Scientific). The concentration of total flavonoid content in the test samples was calculated from the calibration plot (mg/ ml) and expressed as mg rutin (RU)/g of dried plant material. Each test was repeated three times.

Estimation of Chlorogenic Acid (CGA)

Standard solution preparation

For the preparation of the standard solution, a commercially bought CGA (catechol) was dissolved in polar solvents (ethanol/ methanol/ acetonitrile and water). Using a magnetic stirrer, the solutions were equally dissolved, and absorbance was measured immediately after stirring. Furthermore, it was swirled in a dark room to prevent light interaction. Weight 2 mg add 1 ml of DDW. Take 100 µl in 1 ml DDW (100 µl/ml). Prepare CGA (catechol) standard as concentration 0.1, 0.2, 03, 0.4, and 0.1µg/ml and distilled water. The seedling of both genotypes (GT25 and GT26) with different salt treatments were collected and washed thoroughly and blotted. 500 mg were homogenized in 2 ml of chilled water. Homogenate was centrifuged at 8,000 rpm for 5 minutes at 4ºC, and collect the supernatant. The supernatant was washed two times with DCM (Dichloro methane) and kept for the store at -20ºC in a dark place. Double distilled water (DDW) was used as blank as well as to measure the absorbance at 324nm and calculated CGA concentration. 10µl sample used in 2 ml of DDW. Estimation of CGA was done by (Belay and Gholap, 2009) method.

Measurements of antioxidant enzyme activities:

For antioxidant enzyme extractions, 0.2 g of fresh leaves were homogenized with 0.1M phosphate extraction buffer. The filtered homogenate was then centrifuged at 15,000 g for 20 minutes at 4 °C, and the resulting supernatant was used to evaluate the activity of superoxide dismutase (SOD) and peroxidase (POD). Both the enzyme activities were measured by a UV/Visible Spectrophotometer (Thermo Scientific 220). The inhibition of photochemical reduction of nitro blue tetrazolium (NBT) by SOD was measured using the Dhindsa et al. technique (1981). One unit of SOD activity was defined as the amount of enzyme required to cause 50% inhibition of NBT reduction. The POD activity was determined as described by Castillo et al. (1984) using guaiacol as a substrate. One unit of POD activity was defined as the amount of enzyme that increased the absorbance at 470 nm by 0.01 absorbance unit per minute.

Statistical analysis:

The experimental design was completely randomized. All results are presented as the mean values ± standard errors. The absorbance of each extract was evaluated using duplicate assays.

RESULTS AND DISCUSSION

Effects of salinity on irrigation water and soil salinity values are given in Table1 and 2. The mean ECe values increased with increasing salinity levels of applied irrigation water up to 150 Mm NaCl treatment around EC ¼ 14.76 dS m^{-1}. The maximum pH value of 7.92 was observed for the highest treatment (150mM). In our study, increased salinity in irrigation water resulted in a small drop in K content. EC, pH, and sodium levels rise when salt stress in water and soil rises. With increasing salt stress, potassium and phosphorus levels drop. Potassium and phosphorous are decresed with the increased salt stress. Table 3 shows the percentage of seeds that germinated. The lowest seed germination percentage (0-30%) was found in 21 genotypes, while the maximum seed germination percentage (90-100%) was found in two genotypes [IC354140 (GT25); IC 354562 (GT26)]. Genotypes GT-25 and GT-26 showed the greatest germination percentage, therefore to study the salt responsiveness of eggplant genotypes (SRGs), we have selected these two genotypes of eggplant for further study.

Table 1. Physical and chemical properties of the water used in the experiment for salt treatment.

Parameter (s)	water	(25 mM) NaCl	(50 Mm) NaCl	(75Mm) NaCl	(100 Mm) NaCl	(125 mM) NaCl	(150 mM) NaCl
pH	6.25	7.20	7.72	7.78	7.79	7.84	7.92
(EC) (dSm^{-1})	3.29	4.22	6.87	8.85	9.87	11.77	14.76
Na+ conc. (ppm)	52.05	200.2	676.25	771	918	1.059	1.127
K+ conc. (ppm)	194.2	164.4	151.5	133.75	98.05	89.6	57.5
Na+/K+	0.268	1.216	4.463	5.764	9.362	11.819	19.60

Table 2. Physical and chemical properties of the soil after salt treatment (25-150 Mm) NaCl.

Parameter(s)	Soil	(25 mM) NaCl	(50 Mm) NaCl	(75Mm) NaCl	(100 Mm) NaCl	(125 mM) NaCl	(150 mM) NaCl
pH	7.37	7.73	7.82	7.98	8.07	8.18	8.32
EC (dSm^{-1})	1.26	1.46	2.07	2.31	2.46	2.60	2.87
Na+ (ppm)	109.4	128.8	139.45	155.1	160.4	169.75	180.3
K+ (ppm)	122	120.1	110.05	101.05	100.5	85.6	71
Na+/K+	0.896	1.072	1.267	1.534	1.596	1.983	2.539
P (ppm)	132	130.5	128.5	121.2	118	116.9	11.2

Table 3. Germination Percentage (GP) of all genotypes.

S.No	Genotype Accession Number	Germination (%)
1	EC038474	0
2	EC169079	0
3	EC305048	20
4	EC379244	10
5	EC384970	0
6	EC393239	10
7	IC089818	0
8	IC089890	0
9	IC089923	10
10	IC090144	10
11	IC090160	10
12	IC090785	10
13	IC090905	0
14	IC111013	10
15	IC111033	10
16	IC111415	30
17	IC111439	10
18	IC112741	20
19	IC144145	20
20	IC261814	40
21	IC279555	10
22	IC345747	70
23	IC350885	60
24	IC354135	40
25	IC354140	90
26	IC 354562	90
27	IC354672	0
28	IC354707	30
29	IC374852	20
30	IC383372	40

Germinated seedlings (30 days old) of both SRGs were screened at different concentrations (0, 25mM, 50mM, 75mM, 100mM, 125mM, 150mM) of NaCl and observation was taken after 60th days of treatment. Germination percentage under salt stress was drastically reduced (35%) in GT26 compared to GT25 (Table 2). In all SRGs, the total chlorophyll, flavonoid, and chlorogenic acid concentrations gradually declined as the salinity treatments progressed from control to 75mM NaCl (Fig. 1 and Fig. 2). In a 100mM NaCl application, GT26 showed severely stressful effects on seedling growth, but GT25 showed comparable better growth in the same concentration. GT25 showed less reduction in total chlorophyll, flavonoid, and Chlorogenic acid contents under high salinity levels (100mM NaCl).

Seedling length, seedling fresh and dry weight, and leaf area generally decreased with increasing salt levels (75 mM) as compared to control in both the genotypes (Table 4). Among them, genotype 25 (GT25) had the largest leaf no, root length and seedling biomass compared to GT26. In GT26, total chlorophyll concentrations declined when NaCl concentrations increased from control to 75mM NaCl (Fig 1). GT26 showed highly stressful effects on the seedling in 100mM NaCl application, whereas GT25 showed comparative better growth in the same concentration, indicating that both genotypes varied in the magnitude of their responses to salt. Leaves from both genotypes were tested for accumulated flavonoid and chlorogenic acid content after being treated to various levels of salt stress. The CGA contents of both genotypes treated with 0- 150 mM NaCl are shown in Fig.2. In general, CGA accumulation increased gradually with increasing

concentrations of NaCl in both genotypes. The largest increase in CGA content compared to control plants was observed in plants of both varieties treated with 75 mM NaCl ($P < 0.05$). The increase in CGA content in the GT25 was 8-fold compared to controls; it was 3-fold compared to controls in the GT26. When we compared these results between the selected eggplant genotypes, it was observed that the GT26 was more sensitive to salinity than was the GT25. Significant effects of salt eggplant leaves of both genotypes were found for the antioxidant enzyme activities (SOD and POD) (Fig. 3 and 4). Compared with the control, the activities of each antioxidant enzyme increased with salt level. Based on our obtained results, we concluded that the GT26 genotype showed low performance in each parameter can consider as salt-sensitive genotype (SSG), while GT25 genotypes showed high value of all the studies parameters can consider as salt-tolerant genotype (STG) of eggplant. In several eggplant cultivars, increasing NaCl in the solution resulted in a drop in the K/Na ratio and an increase in Na (Akinci et al., 2004). Salt stress (0, 50, 100, and 150 mM NaCl) affected eggplant (S. melongena 'Kemer', 'Pala', and 'Aydin Siyahi') growth and development (% and period; length and fresh and dry weight of radicle and hypocotyl) and seedling stages during the germination stage (length and fresh and dry weight of root, shoot, leaf number, and whole plant). Germination percentage was significantly decreased by salt stress in eggplant genotypes.

Fig 1. Effect of salinity level on Chllorophyll (mg of RU/g) in seedling of eggplant genotype GT25 and GT26.

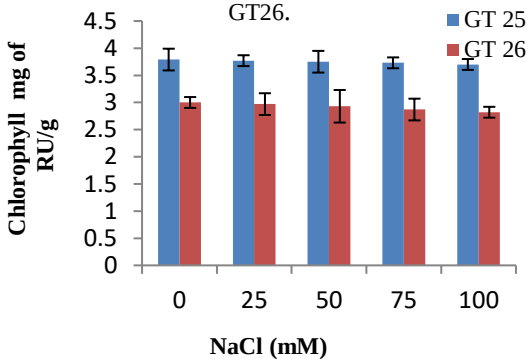


Fig 2. Effect of salinity level on Chlorogenic acid (µg/mg) in seedling of eggplant genotype GT25 and GT26.

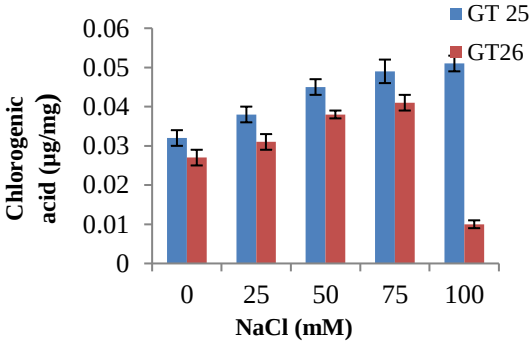


Table 4. Under varied salt treatments, the Germination Percentage (GP) of genotypes 25 and 26.

Genotypes	Germination percentage (%) Salt concentration (NaCl mM)						
	0 (control)	25 mM	50 mM	75 mM	100 mM	125 mM	150 mM
GT25	90	85	70	55	40	No germination	No germination
GT26	90	70	45	35	No germination	No germination	No germination

Table 5. Effect of salt treatments (25 mM-150mM NaCl) on 60 days old seedling length, fresh weight and dry weight in two genotypes (GT25 and GT26) of eggplant (*Solanum melongena* L.).

Genotype (GT)	NaCl (mM)	Seedling length (cm)	Root length (cm)	Seedling fresh wt. (mg)	Seedling dry wt. (mg)
	0	12.2± 0.04	6.2±0.07	11.4±0.007	5.21±0.007
	25	11.8±0.20	6.1±0.07	11.32±0.010	5.11±0.014
	50	11.6±0.20	6.03±0.04	11.21±0.007	5.06±0.008
GT25	75	10.9±0.07	5.3±0.07	10.98±0.014	5.02±0.010
	100	10.6±0.07	5.1±0.07	10.80±0.014	4.99±0.010
	125	-	-	-	-
	150	-	-	-	-
	0	11±0.10	9.53±0.04	6.40±0.021	3.87±0.004
	25	10.7±0.04	9.1±0.07	6.04±0.017	3.81±0.007
	50	10.2±0.07	8.4±0.07	5.93±0.029	3.61±0.010
GT26	75	10±0.07	8.03±0.04	5.64±0.031	3.52±0.010
	100	-	-	-	-
	125	-	-	-	-
	150	-	-	-	-

Fig 3. Effect of salinity level on superoxidase activity (U/gf.wt) in seedling of eggplant genotype GT25 and GT26.

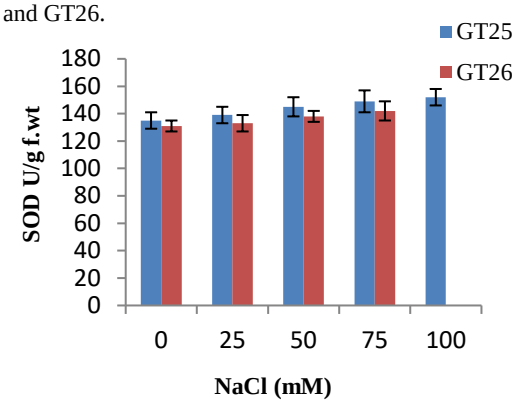
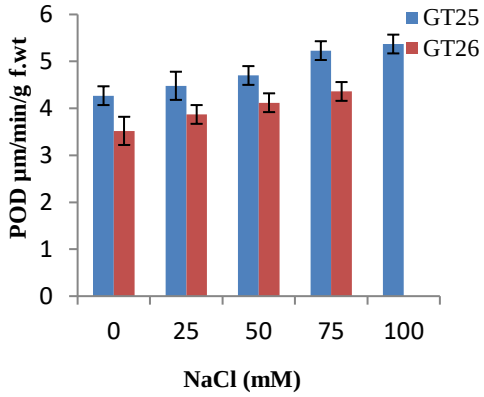


Fig 4. Effect of salinity level on peroxidase activity (µm/min/gf.wt in seedling of eggplant genotype GT25 and GT26.



This was also supported by the findings of (Gholamin and Khayatnezhad, 2010) in wheat and (Mostafavi, 2011) in safflower (Gholamin and Khayatnezhad, 2010). Many researchers have reported similar results (Datta et al., 2009). The fact that seeds appear to develop an osmotically induced "dormancy" under stress conditions may explain the lower germination rate, especially under drought and salt stress. This could be a seed's adaptive strategy to avoid germination in a stressful environment, guaranteeing adequate seedling establishment. The seedling length was significantly reduced due to salinity. This is consistent with recent findings in Wheat (Akbarimoghaddam et al., 2011), Sorghum bicolor (Akbarimoghaddam et al., 2011), and Sorghum bicolor (Akbarimoghaddam et al., 2011). (El Naim et al., 2012). Root and shoot development may be hampered as a result of the toxic effects of greater NaCl concentrations, as well as uneven nutrient intake by seedlings. NaCl toxicity and nutrient absorption imbalance in seedlings can cause a decrease in root and shoot growth. The fresh and dry weights of the shoot and root both decreased as a result of salt stress. This reduction was relatively dependent on a shoot or root lengths. Salt stress significantly decreased the plant fresh and dry weight of Physalis species, demonstrated by (Yildirim et al., 2011). (Datta et al., 2009) found that differing salinity levels had a substantial impact on growth.

Salinity stress caused swelling of membranes in chloroplasts of sensitive plants which affects their chlorophyll content (Stogonov et al., 1962). This is consistent with previous reports (Wahid et al., 2004; Arulbalachandran et al., 2009). The results corroborate with the findings of (Saha et al., 2010 and Yupsains et al., 2001). Further, the chlorophyll and flavonoid content can be used as indicators of plant health stress and nutritional deficiencies.

The polyphenol content and antioxidant activity of the halophyte Cakile marine leaves, for example, were increased by salinity (Ksouri et al., 2007). At 25-50 mM NaCl, the phenolic content of Artichoke leaves increased considerably (Hanen et al., 2008). Antioxidants play a crucial function in the body's defensive system; thus, they increase in reaction to these challenges (Dixon and Palva, 1995). Plants having high levels of antioxidants, either naturally occurring or produced, are more resistant to oxidative damage (Dhindsa and Matowe, 1981).

CONCLUSION

Increased soil salinity caused the plant to consume less water, resulting in a slower growth rate. Soil salinity affect the EC, pH, and mineral compounds found in the soil. Salinity then affects growth parameters of the seedling. Genotype 25 was found to be most tolerant to salt stress among the genotypes. High salt concentrations (100mM) influence eggplant seed germination and seedling growth in the early stages. The present study concludes that the soil salinity affects the seedling growth and selected salt responsive genotypes (SRGs) (GT25 and 26) exhibited significant variations for adaptation towards salt stress.

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