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Growth, Water Relation and Physiological Responses of Three Eggplant Cultivars under Different Salinity Levels

Emad Y. Bsoul[1,*], Shorouq Jaradat[1], Salman Al-Kofahi[2], Ahmed A. Al-Hammouri[2], and Rami Alkhatib[3]

[1]*Department of Biology and Biotechnology, The Hashemite University, Zarqa, Jordan.*

[2]*Department of Lands Management & Environment, The Hashemite University, Zarqa, Jordan.*

[3]*Department of Biotechnology and Genetic Engineering, Jordan University of Science and Technology, Irbid, Jordan.*

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Abstract

Eggplant (*Solanum melongena* L.) is an important traditional crop that is cultivated worldwide. Salinity is one of the major abiotic stress factors that impact crops yield. Seeds of three eggplant cultivars (Blacky, Pearly F1, and Classic) were evaluated under salt stress. Seedlings were treated with salinity solutions induced by a 3:1 ratio of calcium chloride and sodium chloride to four concentration levels measured as electrical conductivity (EC) [1.2 dS/m (control), 2.0 dS/m, 4.0 dS/m, and 8.0 dS/m] for 65 days. Plants had a higher root dry weight when irrigated with 4.0 and 8.0 dS/m solutions. Eggplant cultivars varied in their response to salinity. At both control and 4.0 dS/m, Blacky cultivar had the highest plant height, stem diameter, RGR, NAR, leaf area, stem, leaf, root, and total plant dry weights. However, Blacky had the lowest in all these parameters when subjected to 8.0 dS/m. Results indicate that high salinity levels may alter the pattern of dry matter distribution that preferred investment in roots than in the other plant parts. Under 4.0 dS/m, Blacky seedlings were triggered to develop adaptive mechanisms that could better tolerate saline conditions than when irrigated with 2.0 dS/m water.

Keywords: Eggplant, salt stress, water relations, gas exchange, relative growth rate, net assimilation rate.

1. Introduction

Eggplant (*Solanum melongena* L.) is a traditional crop, cultivated mainly in Asia, Southern Europe and the Mediterranean countries. In 2008, about 1.96 million ha were devoted for eggplant cultivation worldwide (FAO, 2010). In the 21stcentury, some major problems concerning water resources and the increase in soil and water salinization appeared (Shrivastava and Kumar, 2015).

Salinity is one of the major abiotic stress factors that threaten crops yield (Yamaguchi and Blumwald, 2005; Yasar *et al*., 2006; and Shahbaz and Ashraf, 2013), mainly in countries where supplemental irrigation is needed for the crops (Flowers, 2004). When evaporation is greater than precipitation and salts are present in high amounts in the soil, a white layer of dry salt on the soil surface is formed in a process called salinization (Unlukara *et al*., 2010). In 2014, Shurivastava and Kumar reported that high salinity adversely impacted20% of cultivated lands, and 33% of the irrigated agricultural lands. Moreover, there is an annual increase in salinized areas at a rate of 10% due to low precipitation, irrigation with saline water and poor cultural practices (Shurivastava and Kumar, 2014). More than 50% of the arable land is expected to reach high levels of salinity by the year 2050 (Jamil *et al*., 2011).

It is well known that plant metabolism is adversely affected by water stress. Salinity reduces plant growth (Parida and Das, 2005; Paul, 2012) either through osmotic inhibition of water uptake by roots or specific ion effects, which affects cell division, cell expansion, and stomatal conductance (Munns, 2002; Abed El-Azeem *et al*., 2012). The rate and the amount of water that plant roots can absorb are reduced with high soil salinity. This reduction is due to high osmotic pressure of the soil solution leads to physiological drought due to low water availability (Kozlowski, 1987). Around 5% of the productive land all around the world showed reduction in growth, yield and

* Corresponding author. e-mail: ebsoul@hu.edu.jo.

development at physiological and biochemical activity levels due to high salt concentrations (Ghassemi and Jakeman, 1995; Munns and Tester, 2008).

Irrigation with a low water quality is a common source of salts; salts accumulate as water is used by the crop or evaporates directly from the soil (Unlukara *et al*., 2010). In the root zone, soil is considered saline when the Electrical Conductivity (EC) of the saturation extract exceeds 4 dS/m (approximately 40 mM NaCl) at 25 ^{o}C (Shrivastava and Kumar, 2015).Most crops do not grow well under saline conditions. Only salt tolerant plants (halophytes) can grow properly in soils with accumulated salts (Glenn and Brown, 1999).

Eggplant is classified as a very sensitive (Fu *et al*., 2013) to moderate sensitive vegetable crop (Akinci *et al*., 2004; Yasar *et al*., 2006), so more attention on salinity adverse effects is required to improve crop performance, increase productivity and profitability (Akinci *et al*., 2004). Knowing the salinity levels threshold of different eggplant varieties and the impact on the crop yield in response to increasing soil salinity is crucial (Heuer *et al*., 1986). Determining salt tolerance of different eggplant varieties and cultivars helps in minimizing the injury of salinity impact (Akinci *et al*., 2004). Plant tolerance to salinity stress can be determined by identifying the plant responses to different physiological parameters (Chartzoulakis and Loupassaki, 1997).

The objective of this work is to study the physiological response of the three most cultivated eggplant cultivars (Blacky, Pearly and Classic) in Jordan to increasing salinity.

2. Materials and Methods

2.1. Study Location

This study was conducted in a greenhouse at The Hashemite University, Zarqa, 32°05’ N Latitude and 36°06 E Longitudes. Greenhouse day temperatures were in the range of 20-35°C, and mean midday photosynthetic photon flux density (PPFD) was 365 µmol.s-1.m-2measured by a quantum sensor (LI_250A; LICOR.)

2.2. Plant Material and Experimental Design

Seeds of three eggplant (*S. melogena* L.) cultivars (Blacky, Hi-Tech, Denmark; Pearly F1, Hi-Tech, Denmark; and Classic, Harris moran, China) were used for this experiment. Seeds were germinated in trays containing peatmoss (KEKKILA, European Union).

After 30 days, seedlings were transplanted into 5 L pots containing autoclaved mixture media of fumigated peatmoss: perlite: soil (1:1:1v/v). Cloth screens were placed in the bottom of the pots to prevent soil loss. Transplanted seedlings were kept well irrigated in the greenhouse for a month. Plants were fertilized using (Nutri-Leaf 60, USA) (20N-20P- 20K fertilizer) at a rate of 5g/L water one week after transplantation for one time.

Uniform plants from each cultivar were assigned randomly to one of four irrigation treatments (1.2 dS/m (control), 2.0dS/m, 4.0 dS/m, and 8.0 dS/m) for 65 days. The experimental design was completely randomized block design. There were five experimental blocks, each containing a total of 12 plants (3 cultivars x 4 salinity levels). Extra 24 plants (8 from each cultivar) were used to determine the initial growth characteristics before applying the salinity treatment.

2.3. Initial Seedling Traits

On the day the irrigation treatments were initiated,8 plants, from each cultivar, were harvested to determine the initial plant growth traits. The harvested plants were separated into leaves, stem and roots. Data recorded at that time included leaf area, leaf dry weight, stem dry weight and root dry weights. Leaf area (cm2) was measured using a portable leaf area meter (LI-3000A; LI-COR; Lincoln, Nebr. USA). Roots were washed by tab water to remove soil mixture. Oven dry weights of leaves, stems, and roots were determined after drying to a constant weight at 65oC (data not shown).

2.4. Salinity Treatments

A 3:1 ratio of calcium chloride and sodium chloride were respectively diluted in water to prepare the stock solution. Treatment solutions were made by adding stock solution to tap water until the desired salinity levels were achieved. All readings were recorded using an EC meter (Milwaukee SPEM500). On the same day when the initial data were recorded the remaining five blocks were then watered with salinity treatment (EC 2.0 dS/m), to prevent salt shock, except for the control that was watered with tap water (1.2 dS/m). The EC of the irrigated water were continuously and gradually increased until each desired salinity level achieved (1.2 dS/m (control), 2.0dS/m, 4.0 dS/m, and 8.0 dS/m). Once all the experimental plants were receiving their designated salinity level, all treatments were irrigated manually every two days to the field capacity for the total duration of 65 days.

2.5. Physiological Traits

Chlorophyll Concentration Index (CCI) was determined biweekly by averaging two midday readings of each plant. Two youngest fully-expanded mature healthy leaves were selected and measured using plant chlorophyll concentration meter (LI-250A OPTIC-SCIENCES CCM-200). Transpiration and stomatal conductance (gs) were measured biweekly using a steady-state porometer (LI-1600; LICOR; Lincoln, Nebr.). Plant height was measured biweekly from soil surface to the top of the plant for each plant.

2.6. Final Harvest

At the end of the experiment (65 days), all plants were harvested. Harvested plants were washed, air dried on filter paper, separated into leaves, stems and roots. Leaf area (cm2) was determined using a portable leaf area meter (LI-3000A; L-ICOR; Lincoln, Nebr. USA). Stem diameters were measured using an electronic 0-150 mm digital caliper (Swiss). Leaves, stems and roots oven dry weights were determined after drying plant parts to constant weight at 65oC.

Leaf discs from two youngest fully expanded mature leaves of all plants were used to determine Relative Water Content (RWC). RWC was calculated using the equation (FW-DW/SW-DW)(100). Where FW is the fresh weight and DW represents fresh weight sample oven dried at 68 °C and SW represents saturated weight of sample, which

was immersed overnight in distilled water (Bsoul *et al.*, 2006).

Relative growth rates were calculated using the equation of Gutschick and Kay (1995): RGR = (ln W2 - ln W1)/ (T2 - T1), where W2 was the final dry weight at day 121 (T2), and W1 was the initial DW determined from initial data harvest on day 1 (T1). Net assimilation rates (NAR) were calculated as: NAR = M2 - M1/T2 - T1 X log L2 - log L1/L2 - L1, where M2 was the final dry weight at day 65 (T2), and M1 was the initial DW determined from the initial recorded on day one of the experiment (T1). Leaf area ratio (cm2.g-1) was calculated as SLA= leaf area/leaf dry weight. Specific stem length (cm.g-1) was calculated as SSL= stem height/ stem dry weight.

2.7. Statistical Analysis

Statistical analysis was performed using SAS 9.1 software for Windows (2003). Significant differences between values of all parameters were determined at P≤ 0.05 using ProcGlm, PDIFF, ANOVA and Duncan's Multiple Range Tests.

3. Results

Regardless of the treatment, there were no significant differences among cultivars in terms of stem, leaf, shoot, root, and total plant dry weights. In addition, root/shoot ratio, plant height and stem diameter were not significantly different among the three cultivars (Table 1). Regardless of the cultivars, there were no significant differences among the treatments for all these parameters either, except for the root dry weight. Both treatments 4.0 ds/m and 8.0 ds/m accumulated the highest root dry weights (0.63g and 0.57g, respectively)(P= 0.028) (Table 1).However, there were obvious significant cultivar treatments interaction effects for stem, leaf, shoot, root, total plant dry weights, plant height, specific stem length and stem diameter (Table 1).

Blacky cultivar had the highest stem (0.7 g) leaf (2.2 g) root(0.5 g) and total plant dry weights (3.5 g) under control treatment(Figure 1 A-D). On the other hand, when irrigated with 2.0dS/m treatment, Blacky cultivar was among the lowest in terms of stem, leaf, root, and total plant dry weights, while Pearly cultivar maintained the highest. But, under 4.0 dS/m Blacky cultivar restored the maximum stem, leaf, root and total plant dry weights as compared with the other cultivars (Pearly and Classic) (Figure 1 A-D). When irrigated with 8.0 dS/m, Blacky stem, leaf, and total plant dry weight were affected the most. Blacky had stem dry weight about half less, leaf area more than 3 fold less, and more than two fold less total plant dry weight than that when irrigated with 4.0 dS/m water. In addition, Blacky had the lowest stem, leaf and total plant dry weights when compared with Pearly and Classic cultivars at 8.0 dS/m(Figure 1 A, B and D).

Under 2.0 dS/m, Blacky had the shortest plant height, while at 4.0 dS/m, Blacky cultivar height recovered and had the tallest plant height (16.6 cm) at 4.0 dS/m. At 8.0 dS/m Blacky height had no significant difference than the other cultivars (Figure 1 E). No significant differences were found among cultivars in the stem diameter under all treatments, except for Blacky that had the lowest stem diameter (3.83 mm) when irrigated with water with an EC of 8.0dS/m (Figure 1 F).

Table 1. Plant biomass dry weights, root to shoot ratio, plant height, Stem diameter (SD), relative water content (RWC),and specific stem length (SSL) of three eggplant cultivars (Blacky, Pearly, and Classic) subjected to four salinity treatments (1.2 dS/m (control), 2.0dS/m, 4.0 dS/m, and 8.0 dS/m) for 65 days.

Cultivar	Stem DW (g)	Leaf DW (g)	Shoot DW (g)	Root DW (g)	Plant DW (g)	Root/ Shoot (g)	Plant height (cm)	SD (mm)	RWC (%)	SSL ($cm \cdot g^{-1}$)
BLACKY	0.65[z]a	1.38a	2.03a	0.48a	2.50a	0.26a	15.3a	4.2a	0.51[z]b	24.33a
PEARLY	0.64a	1.14a	1.78a	0.51a	2.29a	0.28a	14.7a	4.3a	0.56a	25.37a
CLASSIC	0.66a	1.43a	2.08a	0.53a	2.61a	0.26a	14.5a	4.4a	0.57a	23.28a
Treatment										
Control	0.61a	1.28a	1.89a	0.41b	2.29a	0.23a	14.8a	4.2a	0.54a	25.78a
2.0dS/m	0.64a	1.06a	1.69a	0.42b	2.11a	0.24a	14.8a	4.2a	0.54a	25.37a
4.0 dS/m	0.67a	1.72a	2.39a	0.63a	3.01a	0.28a	15.1a	4.5a	0.55a	23.10a
8.0 dS/m	0.68a	1.21a	1.88a	0.57a	2.45a	0.31a	14.5a	4.3a	0.55a	23.05a
P-value										
Cultivar	0.93	0.37	0.44	0.78	0.58	0.84	0.27	0.29	0.017	0.388
Treatment	0.59	0.06	0.11	0.028	0.08	0.13	0.81	0.17	0.957	0.253
[zz]CxT	0.0009	0.001	0.0007	0.024	0.001	0.21	0.023	0.01	0.178	0.0004

[z]Means (n = 5) within columns followed by the same letter were not statistically different. Means were assessed at $P \leq 0.05$ using ProcGlm, PDIFF option of SAS.

[zz]CxT: interaction between cultivar and treatment.

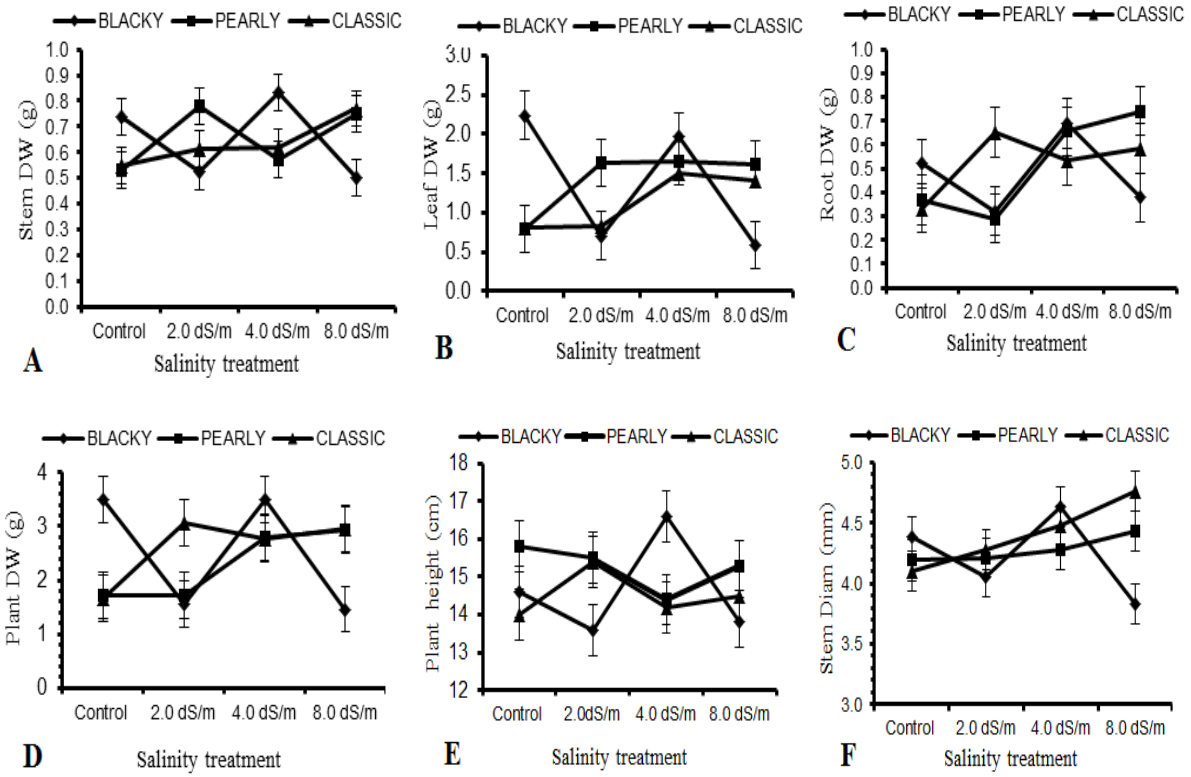

Figure 1. Plant stem dry weight (A), leaf dry weight (B)dry weight (C), total plant dry weight (D) plant height (E), and Stem diameter (F), of three eggplant cultivars(BLACKY, PEARLY, and CLASSIC) subjected to four salinity treatments (1.2 dS/m (control), 2.0dS/m, 4.0 dS/m, and 8.0 dS/m) for 65days.Each point represents a mean ± SE (n = 5).

Significant differences were recorded among cultivars at the end of the experiment in their RWC (P= 0.017) (Table 1), NAR (P= 0.002), and RGR (P=0.0301) (Table 2). Blacky cultivar had the lowest RWC (0.51 %), and RGR (0.016 g•g-1•d-1) while Pearly and Classic had the maximum and similar RWC and RGR. Classic cultivar had the highest NAR (0.044 mg•cm-2•d-1)and was significantly higher than that of Pearly and Blacky (Table 2).

Regardless of cultivars RGR had significant differences among treatments (*P*=0.0358), plants irrigated with 2.0 dS/m had the lowest RGR (0.016 $g•g^{-1}•d^{-1}$)with no significant differences among the other treatments (Table 2).On the other hand, there were no significant differences among treatments for RWC (*P*= 0.957) (Table 1), NAR (*P*= 0.065), SSL (*P*= 0.253), and LA (*P*= 0.11) (Table 2). However, cultivar treatment interaction effects were highly significant for NAR (*P*= 0.0005), RGR (*P*= 0.0003), SSL (*P*= 0.0004), and LA (*P*= 0.003), while there was no significant treatment cultivar interaction for the RWC (*P*= 0.178) (Table 1).Chlorophyll content index, stomatal conductance and transpiration had no significant differences among cultivars (*P*-values = 0.44, 0.32, and 0.15, respectively)treatments (*P*-values = 0.84, 0.80, and 0.76 respectively) and cultivar*treatment interaction (*P*-values = 0.68, 0.39, and 0.58, respectively) (Table 2).

Blacky cultivar had the highest RGR (*P*= 0.0003) and NAR (*P*= 0.0005) under control treatment, but it had the lowest RGR and NAR under 2.0 dS/m (Figure 2 A and B).However no significant differences were recorded among cultivars under 4.0 dS/m. under the highest salinity treatment 8.0 dS/m, Blacky cultivar had about half RGR and four-folds less NAR than both Pearly and Classic cultivars. In addition, if we compare the NAR and RGR for the three cultivars, we will notice that the NAR and RGR followed the same trend under all treatments (Figure 2 A and B).

Despite that the Classic cultivar had the highest SSL (30.4 $cm•g^{-1}$) under control treatment (*P*= 0.0004), its SSL continued to decrease as the EC increase and had the lowest SSL (19.8 $cm•g^{-1}$) under 8.0 dS/m (Figure 2 D). On the other hand, Blacky cultivar had the lowest SSL under control treatment (20.1 $cm•g^{-1}$), but under 8.0 dS/m Blacky had the highest SSL (28.2 $cm•g^{-1}$)(Figure 2 D).

When irrigated with tap water, Blacky cultivar had the highest LA (498.7 cm^2) (*P*= 0.003) and about four folds more than Classic (142.1 cm^2), but its LA reduced to about four folds (142.1 cm^2) under 2.0 dS/m. However, Blacky had among the highest LA under 4.0 dS/m (377.7 cm^2). Under 8.0 dS/m Blacky LA had the lowest LA (140.1 cm^2)(Figure 2 E).

Plants chlorophyll content index was maximum (38.1) (*P*<0.0001) after 28 days from the time when plants were irrigated with salinity treatments. However, plants CCI reached (29.6) after 42 days and continued to decrease to the lowest (9.3) after 65 days and lost about four folds (Figure 3 A). After 28 days plants had the lowest transpiration rate (21.7$mmol•m^{-2}•s^{-1}$) (*P*<0.0001), but had the highest (63.2$mmol•m^{-2}•s^{-1}$) after 65 days (Figure 3 A).Plants stomatal conductance was the lowest (345.6 $mmol•m^{-2}•s^{-1}$) (*P*<0.0001) after 28 days then continued to increase to the highest (2092.0 $mmol•m^{-2}•s^{-1}$) at the end of the experiment (Figure 3 B).

Table 2. Plant net assimilation rate (NAR), relative growth rate (RGR), leaf area (LA), Chlorophyll content index (CCI), stomatal conductance g_s, and transpiration (Trans.) of three eggplant cultivars(BLACKY, PEARLY, and CLASSIC) subjected to four irrigation treatments (1.2 dS/m (control), 2.0dS/m, 4.0 dS/m, and 8.0 dS/m) for 65days.

Cultivar	NAR ($mg•cm^{-2}•d^{-1}$)	RGR ($g•g^{-1}•d^{-1}$)	LA (cm^2)	CCI	g_s ($mmol•m^{-2}•s^{-1}$)	Trans. ($mmol•m^{-2}•s^{-1}$)
BLACKY	0.024b	0.016b	290.7a	10.4a	2102.9a	63.56a
PEARLY	0.032b	0.018a	234.2a	8.3a	2175.2a	63.77a
CLASSIC	0.044a	0.020a	283.3a	9.1a	1972.4a	62.31a
Treatment						
Control	0.028a	0.017a	278.1a	9.9a	2099.9a	63.7a
2.0dS/m	0.028a	0.016b	214.7a	8.3a	2064.1a	62.8a
4.0 dS/m	0.028a	0.021a	342.9a	9.7a	2036.5a	62.8a
8.0 dS/m	0.033a	0.018a	241.9a	9.2a	2133.5a	63.5a
P-value						
Cultivar	0.002	0.0301	0.43	0.44	0.32	0.15
Treatment	0.0651	0.0358	0.11	0.84	0.80	0.76
[zz]CxT	0.0005	0.0003	0.003	0.68	0.39	0.58

[z]Means (n = 5) within columns followed by the same letter were not statistically different. Means were assessed at $P \leq 0.05$ using ProcGlm, PDIFF option of SAS.

[zz]CxT: interaction between cultivar and treatment.

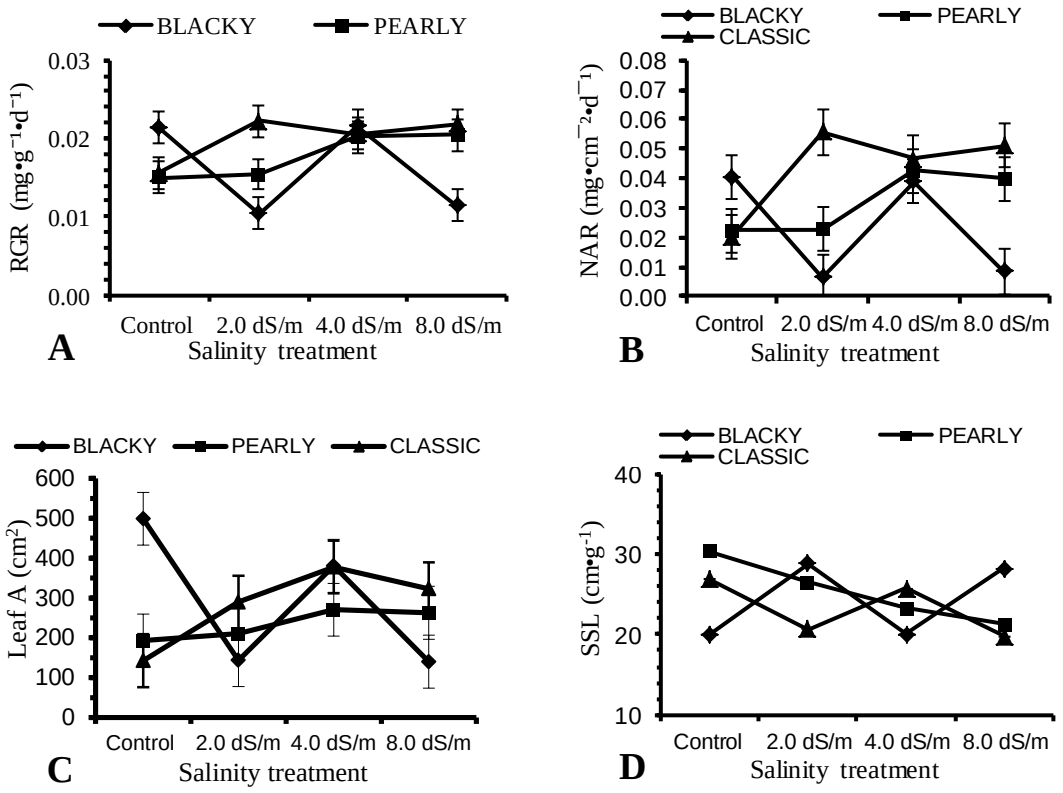

Figure 2.Relative growth rate (A),Plant net assimilation rate (B), leaf area (C), and specific stem length (D) of three eggplant cultivars (BLACKY, PEARLY, and CLASSIC) subjected to four irrigation treatments (1.2 dS/m (control), 2.0dS/m, 4.0 dS/m, and 8.0 dS/m) for 65 days. Each point represents a mean ± SE (n = 5).

4. Discussion

Developmental traits associated with water deficit responses are important to quantifying plant adaptation mechanisms to water shortage (Blum, 1996). The scant differences of stem, leaf, shoot and total dry weights among cultivars and treatments at the end of the experiment is devoted to varied and altered plant growth and physiological responses of the cultivars to the salinity levels during the experiment. Fu *et al*. (2013) reported that eggplant capability to survive and grow during stress periods were enhanced according to their morphological and anatomical responses .

Cano *et al.* (1998) suggested that root growth is the most indicative parameter for salt tolerance. Because the roots are more sensitive to salt stress than the other plant parts, the only effect of treatment was higher root dry weight in plants irrigated with4.0 dS/m and 8.0 dS/m water. Savvas and Lenz (2000) had the same results and reported that the only effect of salinity treatments was on the root dry weight that was greater in eggplants exposed to NaCl-salinity. Results indicate that the high salinity levels may actually alter the partitioning pattern of dry matter preferring investment in the roots. Similar results were also recorded in kiwifruit (Chartzoulakis *et al*., 1995) and in beans (Seemann and Critchley, 1985).Maintenance of root growth during physiological drought is an obvious advantage to maintain an adequate water supply, and varied with plant genetics (O'Toole and Bland, 1987).

Blacky cultivar had the highest stem, leaf, and root and total plant dry weights under control treatment. But, all of these parameters had extreme reduction as salinity treatment increased slightly to 2.0 dS/m (Figure 1 A-D). However, plant parts dry weights recovered and increased sharply to the highest at 4.0 dS/m. On the other hand, Blacky failed to withstand high salt concentration and its dry weights reduced to the lowest at 8.0 dS/m (Figure 1 A-D). According to the results of many studies, plants may differ in their salinity response to vegetative growth and root development. The vegetative dry weight of eggplant decreased with increasing soil salinity. But it is not unusual to observe an increase in the yield with an initial increase in salinity. The positive effect of low salinity on shoots of several plants has been reported by many other authors. The cause is not known but could be related to mineral nutrition (Unlukara *et al*., 2010; Andriolo *et al*., 2005).Plants lose most of the water through leaves. Thus, Blacky cultivar escaped low available water through the restriction of leaves growth to about 70% less than the control (Figure 2 E). Reducing leaf size was considered as first symptom of water deficit (Mohd *et al*. 2004).Torrecillas *et al*. (1995) found that tomato had less leaf area under water deficit compared to control plants (Saei *et al*.,2006).

Increasing the stem diameter of Pearly and Classic cultivars at 8.0 dS/m has advantages over Blacky cultivar even, though; the cultivars had no significant differences at low salinity treatments. Wide stem diameter could provide easier path for water to supply the upper plant parts (Bsoul *et al*., 2016; Lis *et al*., 1989).

The RWC of Blacky averaged 51% suggesting that the foliar of Blacky cultivar endure low RWC yet maintain adequate photosynthesis. Chaves (1991) reported that photosynthetic activity is reduced when RWC ranges from 40% to 70%. RGR represents to which extent a plant invests its photosynthesis in current growth and enhances its capacity for future photosynthesis (Fitter and Hay, 2002). Efficiency of eggplants to accumulate dry matter under salt stress (NAR) is cultivar-dependent. Blacky cultivar was more efficient in dry matter accumulation at 4.0 dS/m but that efficiency (NAR) dropped to the minimum when irrigated 8.0 dS/m water. RGR and NAR of Blacky followed similar trend (Figure 2 B). RGR and NAR data suggest that rapid growth is not advantageous under salinity conditions to conserve resources.

Because SSL indicates length of stem allocated to each unit of biomass, this ratio could be used to determine stem's mechanical strength (Bsoul *et al*., 2006). Black cultivar maintained lowest SSL at 4.0 dS/m (Figure 2 D), which indicates that Blacky had the strongest stem and better water conduction rout to the above plant parts. In addition, the strong stem maintains plant erection habit and prevents logging, which would be more suitable trait under that salinity level.

At the end of the experiment, cultivars and treatments had no effect on stomatal conductance, transpiration, and Chlorophyll content index. Eggplant cultivars begin to lose their chlorophyll content when treated with saline water (Figure 3 A). At increasing levels of salinity, chlorophyll degradation occurs (Malibari *et al*., 1993; Salama *et al*., 1994). Excess salt in chloroplasts causes shrinkage of thykaloids and stacking of adjacent membranes of grana. Reduction of chloroplasts occurred also as a result of ionic imbalances (Blumwald *et al*., 2000). Reduction of stomatal conductance and transpiration rate are considered as adaptations to protect plants from dehydration. It is known that both stomatal conductance and transpiration rate decrease with a higher vapor pressure deficit that is a consequence of elevated temperature (Bunce, 2000; Lloyd and Farquhar, 2008). The increasing in g_s and transpiration rate were affected by the day temperature when data were recorded (33.8 ^{o}C ± 5.6) more than salinity treatments or cultivars. Similar results were reported with tomato plants under water deficit (Bsoul *et al*., 2016).

5. Conclusion

Results indicated that high salinity levels may alter the pattern of dry matter distribution that preferred investment in roots for more water resources. Eggplants could maintain acceptable growth with a RWC around 51 %.Under saline conditions stomatal conductance and transpiration rate were affected and lessened by the high day temperature more than the increased salt concentration. Chlorophyll content of eggplants was adversely affected by salt stress. Under moderate salinity levels around 4.0 dS/m some eggplant cultivars like Blacky were triggered to develop adaptive mechanisms that could tolerate saline conditions better than when irrigated with 2.0 dS/m water. Our results are nominating Pearly and Classic eggplant cultivars for cultivation under high salinity levels as they gained better adaptive characteristics than Blacky at 8.0 dS/m., while Blacky is suitable when irrigated with 4.0 dS/m water.

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