Current Trends in Natural Sciences
Vol. 11, Issue 21, pp. 381-389, 2022
https://doi.org/10.47068/ctns.2022.v11i21.042
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

ASSESSMENT OF THE RESPONSE OF SOME MELON GENOTYPES (CUCUMIS MELO. L) TO DIFFERENT DOSES OF SODIUM CHLORIDE (NACI)

Ulrich Funga[1], Hasan Pinar [1]*, Aydin Uzun [1]

[1] Erciyes University, Department of Horticulture, Kayseri, Turkey

Abstract
Soil salinity is one of the major problems in agriculture, most saline soils are found in arid and semiarid regions. As in other plant species, soil salinity also affects melon production. It is important to use tolerant varieties to be least affected by soil salinity. In present study, two local Turkish cultivar and three their crossed population (Semame, Uzbek, SemamexAnanas, AnanasxSemame and MidyatxAnanas) were tested under in vitro and pot experiments using different NaCI conditions(0, 100,150 and 200 mM). The results have shown that selection for salt tolerance high salt concentration (150 mMol) has negative significant effect on melon performance. Among the five tested cultivars, Midyat x Ananas and Uzbek showed more tolerance compared to other cultivars. In greenhouse, plant heigh, stem diameter and leaf length of Midyat x Ananas had their highest value at 100, 150 and 200 mM, respectively. Meanwhile, best performances of Uzbek for plant height, root dry matter content, root length, leaf length and diameter were obtained at 100 mM. Except for MidyatxAnanas, increase in salt concentration had less impact on plant growth. There was more correlation among morphological and physiological variable in greenhouse experiment compared to in-vitro experiment, therefore it is advised to select melon plants once they start flowering or at least after three months as it has been demonstrated in this experiment.

Keywords: Melon, salt tolerance, screening.

1. INTRODUCTION

Soil salinity is one of the major problems in agriculture, most saline soils are found in arid and semi arid regions. In fact, 20% of arable lands are facing salinity issues and 50% of irrigated lands are affected by soil salinity (Ulas et al., 2020). Low precipitation, high surface evaporation, decomposition of bedrocks, irrigation processes with salty water can be considered as the main causes of soil salinity. Every year, the proportion of salt affected areas increases by 10%. For this reason, it is estimated that 50% of arable lands will suffer of salinity by 2050 (Shrivastava & Kumar, 2015). In Turkey for instance, Barren land accounts for 1518722 hectares among which 41% are slightly saline, 33% saline, 0.5% alkaline, 8% slightly saline-alkaline, and 17.5% saline-alkaline (Karaoğlu & Yalgın, 2018). In the world, activities such as irrigation also contribute in the accumulation of salt in the soil; especially when salty water is used, data of soil salinity caused by the use of saline water has been recorded in several countries.
Melon (*Cucumis melo* L.) is a plant grown in tropical regions with 2n = 24 chromosomes. It is plant which is found all over the world (Goutam et al., 2020). There is no clear information about the

*Corresponding author, E-mail address: hpinarka@yahoo.com

origin of melon; however population variation, molecular and taxonomy data have been used to identify to suggest that it originated from Africa then Asia. Traditionally grown cantaloupe has as main origin eastern Asia, central Asia, Turkey, Syria, Iran, Afghanistan, Southern and Central Indonesia, Transcaucasia, Turkmenistan, Tajikistan and Uzbekistan (Thakur et al., 2019).
In turkey, melon is a crop with high economic value, after China the country is the second largest producers in the world, its production is estimated at around 1.7 million for a surface area of 110,000 hectares (Özbahçe, 2014). Melon production shows a wide distribution in Ege, Marmara, Central Anatolia, Eastern Anatolia, Southeast Anatolia and Mediterranean regions (Özey &caliskan, 2019). Like most plants, melons are sensitive to salinity, and many research have concluded that melon is a plant that can withstand salinity and have some of its biological properties increased. Zong et al. (2011) observed that soluble solids increased with increase in the amount of salt, but the fruit size and yield were reduced. Salinity affects photosynthesis rate of melon, retard growth and decreases yield by reducing stomata conductance, transpiration and increasing toxic ions (Na^+, Cl^-) (Ibrarullah et al., 2019).
Melon's response to salinity has several times been reported in soil and hydroponic conditions, there is no data available on its response in vitro environment. In this study, two melon varieties and three hybrid combinations are evaluated, the objective it to assess their morphological and physiological response under different salt concentration in soil and in tissue culture media.

2. MATERIALS AND METHODS

This research was carried out in the greenhouse and tissue culture laboratory located at Erciyes University. The experimental design was a 4*5 factorial design with each treatment repeated thre times. In this experiment sodium chloride doses 0, 100, 150, 200 mMol NaCl were applied on three different hybrid combinations of melon (Semame x Ananas, Ananas x Semame and Midyat x Ananas) and two local varieties (Uzbek and Semame).
Seed planting and plant cultivation
Melon seeds were planted in 20 holes seedling trays containing a mixture 60% peat moss and 40% perlite, in each hole to seeds were sown. Watering was done every two days to make sure that germination occurs properly. A month later, when seedlings had reached 3-4 leaves- stage, they were transferred into small size nursery containers filled with a mixture of perlite, peat moss and soil. The medium was supplemented with potassium nitrate (KNO_3), MAP and microelements as plants were growing, the greenhouse temperature varied between 25-30 degrees Celsius.

2.1 NaCI application

The applications of NaCl were started immediately after plants had been transplanted to nursery pots. For the first week plant were stimulated with a continuous low application of NaCl (50mMol) until the final concentration of each treatment was attained; for 50, 100, 150 and 200mMol dose, 50mMol NaCl was applied daily for one, two, three and four days respectively. From the following week, plants were subjected to direct NaCl treatment 0, 100, 150 and 200mMol, which was done once every week and lasted for four weeks.

2.2 In vitro culture

Seed of individual genotypes were first sterilized and germinated in petri dishes containing hormone free medium (1/2 MS+ 7g sucrose) , then they were transferred to big jars still containing the same medium for proper development. Sterilization was performed in a laminar flow hood; the seeds firstly were treated with 70% ethanol for 1 minute, 10% domestos for 4 minutes, and then rinsed with pure water three times. Later, seeds were dried on filter paper before they were put into

*Corresponding author, E-mail address: hpinarka@yahoo.com

Petri-dishes. Few days later, germinated seeds corresponding to each genotype were transferred into jars and kept until they developed true leaves; the jars carried 2-3 germinated seeds. Two weeks later, true leaves started appearing and data collection began.

2.3 Membrane damage index

A disc-shaped section of freshly harvested leaves put into small glass containers half filled with pure water. Five hours later, electrical conductivity of each sample was measured and the tubes were autoclaved at 121oC, for 30 minutes. The glass containers were allowed to cool down before a second reading was taken using EC meter. The value of electrical conductivity was obtained with EC meter. Membrane damage index (MDI) index was then calculated using the following formula:

MDI = (Lt-Lc/1-Lc) x 100

Lt: EC reading before autoclaving/EC reading after autoclaving.

Lc: EC reading of control samples before autoclaving / EC reading of control samples after autoclaving (Deveci et al., 2017).

2.4 Relative water content index (RWCI):

The weight of freshly harvested leaves was recorded, and then the disc-shape like of each leaf sample was put into a small glass container also half filled with water, sample leaves were kept in the container for four hour before a second reading could be recorded. The dry matter content was obtained by drying a leaf of each plant treatment in an oven at 35^{o}C for seven days. The relative water content index was calculated using this equation: RWCI = [YA-KA)/ (TA-KA] x 100.

YA: fresh weight

KA: fresh weight after four hours in water

TA: dry matter content

2.5 Plant vigor:

Plant vigor was evaluated on a scale of 0-4 during harvesting.

0= leaves are completely green, and have no dry or colored spots.

1= leaves are slightly yellow and possess few dry spots.

2= 20% of plant leaves is affected by dry spots and exhibit yellowish color.

3= 40% of the plant leaves dried up.

4= the plant is dead or more than 50% of the leaves turned yellow or became dry.

3. RESULTS AND DISCUSSIONS

3.1 Effect of salinity on plants grown in greenhouse

Not all morphological parameters were significantly different for each genotype; while at low NaCl concentration some genotypes exhibited high performance for one or more parameters, others performed well at high concentration.

There was a significant difference in all parameters ($p<0.05$) except in leaf length and leaf number for Uzbek variety. The absence of salt and low dose application (100mMol NaCl) provided the best results in all parameters.

For Semame x Ananas combination, significant difference ($p<0.05$) was observed in stem diameter, dry matter content in stem and root, leaf diameter, number of leaves and plant vigor. Except for stem diameter which highest performance was recorded at 100mMol NaCl, the best performance was revealed in control plants.

There was a significant difference in plant diameter and leaf number of Ananas x Semame combination, control plants had the largest diameters and more leaves, meanwhile at 200mMol they were the smallest. Other parameters did not show any significant difference.

*Corresponding author, E-mail address: hpinarka@yahoo.com

Current Trends in Natural Sciences
Vol. 11, Issue 21, pp. 381-389, 2022
https://doi.org/10.47068/ctns.2022.v11i21.042
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Midyat x Ananas combination recorded a significance difference ($p<0.05$) in stem diameter, dry matter content in stem, root length, leaf number, length and plant vigor. The best and poorest performance of stem diameter was respectively observed at 150 and 200 mMol salt concentration. The longest and shortest leaf length occurred when 200 mMol and 150 mMol sodium respectively were applied. Control plants for other parameters had the highest performance.

The result obtained shows that there was a significant difference in response of Semame to treatments for all parameters. The largest stem diameter was obtained when 100mMol sodium was applied meanwhile the smallest was obtained with 150 mMol sodium application. Control plants performance was the best for all other parameters while 200mMol application dose led to poor results.

For all cultivars, plant height and stem diameter are the two parameters which were significantly affected by salt stress. All cultivars developed vigorous stems at low salt concentration. However, the best plant height and most vigorous stem diameter of midjat x ananas was obtained at 150mMol (Table 1).

Table 1. Morphological characteristics of plants grown in greenhouse conditions

Genotype	NaCI doses	Plant height (cm)	Stem diameter (mm)	Stem DMC (grs)	Root DMC (grs)	Root lenght (mm)	Leaf lenght (grs)	Leaf diameter (mm)	Leaf number	Plant vigor	Leaf area
Uzbek	0	40.5±0.41a	5.65±0.12a	1.87±0.31a	0.22±0.05ab	56.60±9.79ab	74.85±1.6a	85.55±3.18a	14.5±0.51a	0±0c	62.12±0.05a
	100	40±5.4b	4.5±0.41b	1.10±0.24b	0.23±0.05a	71.20±14.47a	79.43±21.88a	72.46±21.08a	14.25±3.77a	1.75±0.5b	57.56±4.61ab
	150	37±0.82ab	4.85±0.2b	1.02±0.27b	0.15±0.01bc	66.70±10.28a	63.85±10.90ab	82.65±4.44a	11±0.82a	3.5±0.4a	52.77±0.49ab
	200	26.5±12.66b	3.7±0.24c	0.58±0.21c	0.14±0.03c	44.40±16.08b	51.50±11.34b	70.25±23.80a	12±2.45a	1.5±0.4b	36.18±2.70b
Şemame x Ananas	0	64.67±10.78a	3.36±0.24ab	1.6±0.31a	0.25±0.06a	150.60±18.15a	80.03±13.23ab	84.77±12.58a	18.33±3.3a	0±0b	67.84±1.66ab
	100	49±13.39ab	4±0.89a	1.48±0.17a	0.15±0.01b	121.35±62.55a	94.38±12.43a	90.60±9.87a	17.5±3.87a	1±0.81a	85.50±1.23a
	150	51.75±2.75ab	2.28±0.74bc	0.85±0.16b	0.15±0.03bc	135.40±62.55a	74.65±20.27ab	82.03±14.70a	12.75±1.89b	1±0a	61.23±2.98ab
	200	46.25±8.06b	1.9±0.5c	0.63±0.35b	0.08±0.02c	100.48±43a	67.09±14.44b	59.96±8.83b	6.25±1.5c	1±0a	40.23±1.28b
Ananas x Semame	0	77.75±14.2a	3.15±0.41a	1.56±0.09a	0.082±0.05a	77.92±14.50a	71.35±27.54a	80.45±34.78a	21.5±7.19a	2±0.81a	59.41±11.20a
	100	72.5±22.65ab	2.28±0.19ab	1.03±0.3b	0.07±0.02a	56.47±23.59a	69.67±9.44a	79.42±72a	15.25±2.22ab	1.75±0.95a	55.34±0.92a
	150	68±8.64ab	2.43±0.78ab	0.92±0.04b	0.07±0.01a	63.96±15.68a	70.30±1.55a	80.80±10.78a	16.33±0.47ab	2±0.81a	56.80±0.17a
	200	50.5±12.26b	2.13±0.83b	0.77±0.22b	0.07±0.02a	51.40±22.19a	76.55±19.36a	88.92±12.45a	12.25±6.75b	1.5±0.57a	68.07±2.41a
Midyat x Ananas	0	54±16.31ab	5.47±0.58b	2.03±0.62ab	0.21±0.12a	62.53±11.62b	68.30±14.07ab	92.70±24.97a	18.33±2.62a	0±0d	63.31±3.52a
	100	59.5±1.22a	5.4±0.24b	2.48±0.20a	0.21±0.01a	99.90±1.55a	78.25±9.44a	95.20±24.57a	15±1.63b	0.5±0.4c	74.49±3.96a
	150	52.5±0.41ab	7.95±1.1a	1.80±0.26b	0.14±0.01a	32.90±0.08d	56.10±1.55b	85.80±9.22a	14±1.63b	1±0b	48.13±0.17a
	200	41±2.45b	4.15±0.12c	1.13±0.19c	0.12±0a	50.10±1.3c	79.50±19.36a	87.85±15.79a	10±1.63c	2±0a	69.89±3.04a
Semame	0	50.33±3.86a	3.57± 1.45ab	1.52±0.1a	0.20±0.05a	75.53±12.66a	97.30±15.69a	89.20±9.98a	21.67±4.99a	0±0c	86.79±1.57a
	100	40.5±7.9b	4.75±1.53a	1.23±0.48ab	0.21±0.09a	89.12±30.46a	89.10±21.62a	84.65±21.91a	19.25±3.5ab	1.25±0.5b	75.42±4.74a
	150	30.75±4.57c	2.65±1.07c	0.99±52b	0.14±0.01a	80.50±15.16a	75.40±21.30a	77.65±20.29a	16.5±4.51ab	2.5±1.29a	58.55±4.32a
	200	23±2.45c	2.9±0.41ab	0.35±0c	0b	0b	0b	0b	13±0b	0±0c	0±0b

*Data with the same letters are not significantly different

Membrane damage index of all genotypes was significantly different; it increased with sodium concentration, at 100 and 200mMol, the lowest and highest MDI were respectively recorded. Relative water content was highly influence in most genotype except in ozbek and midjat x ananas, it highly varies with regard to salt concentration (Table 1).

*Corresponding author, E-mail address: hpinarka@yahoo.com

Current Trends in Natural Sciences
Vol. 11, Issue 21, pp. 381-389, 2022
https://doi.org/10.47068/ctns.2022.v11i21.042
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

3.2 Effect of salt stress on in-vitro plants

In in-vitro conditions, only leaf diameter of Uzbek cultivar was positively affected by salinity; leaf diameter increased with salt stress. In Semame x Ananas combination, significant effect of salt was observed in plant height and leaf length, for both parameters plants response to stress varied.
The genotype AnanasxSemame showed a significant difference only for plant height. Height of control plants, 15.40 cm was higher compared to the one obtained when 200mMol sodium was applied.
The combination MidyatxAnanas revealed a significant difference ($p < 0.05$) in almost all parameters, plant height 27.5 cm at 150mMol, stem diameter 2.2 mm at 200mMol, dry matter in stem 0.2gr at 100mMol and leaf length 30.5mm at 200mMol were identified as the best performances.
Salt stress significantly affected dry matter content (stem and root) in semame cultivar. Plants performed better in absence of salt or at low concentration (100mMol).
There was no significant effect of salt stress on MDI for all cultivars except MidyatxAnanas. For this cultivar, the highest MDI was obtained at 100mMol. Midjat x Ananas and semame were the only cultivar which relative water content index was significantly affected by saline condition. Both had their highest value when 100Mmol NaCl was applied (Table 2).

Table 2. Response of plants to sodium (in-vitro)

Genotype	Salt concentration	Plant height (cm)	Plant diameter (mm)	Stem DMC (grs)	Root DMC (grs)	Root lenght (mm)	Leaf lenght (mm)	Leaf diameter (mm)	EC. index	RWC index
Ozbek	0	11.16a	2.66a	0.01a	0.04a	71.06a	34.60a	19.00ab		72.33a
	100	12.83a	3.13a	0.05a	0.01a	104.83a	31.93a	16.03b	5.77a	57.46a
	150	5.33a	2.63a	0.00a	0.02a	129.86a	29.73a	19.13ab	15.98a	59.06a
	200	8.50a	2.43a	0.00a	0.01a	44.93a	32.40a	21.56a	28.54a	72.33a
Semame x Ananas	0	10.50ab	2.20a	0.01a	-0.00a	93.06a	24.73ab	12.93a		74.24a
	100	13.86a	2.03a	0.03a	0.00a	90.30a	28.86a	18.36a	1.470a	73.27a
	150	5.40ab	2.83a	0.01a	0.00a	106.10a	25.46ab	19.16a	-0.92a	68.67a
	200	3.70a	2.50a	0.00a	0.04a	58.13a	21.60b	16.36a	1.10a	64.04a
Ananas x Semame	0	15.40a	1.76a	0.01a	0.00a	84.86a	29.30a	11.93a		58.57a
	100	12.80a	2.56a	0.00a	0.00a	84.16a	26.33a	12.20a	58.55a	51.90a
	150	7.36b	2.73a	-0.00a	0.00a	186.43a	26.86a	16.30a	13.96a	46.60a
	200	4.46b	2.50a	-0.00a	0.00a	118.60a	25.90a	12.90a	-2.68a	54.41a
Midyat x Ananas	0	13.60c	1.60d	0.01b	0.01a	68.00a	18.50c	15.90a		95.95b
	100	18.44b	2.15b	0.02a	0.00a	71.15a	26.25b	18.20a	50.00a	120.29a
	150	27.50a	2.10c	0.01b	0.00b	75.10a	18.80c	15.20a	10.87ab	5.60b
	200	3.70d	2.20a	-0.00c	0.00b	46.00b	30.50a	16.90a	-1.42b	84.36c
Semame	0	10.50a	2.20a	0.01b	0.01a	57.83a	25.13a	20.50a		84.08ab
	100	13.86a	2.03a	0.05a	0.00b	76.53a	27.56a	22.30a	4.43a	112.07a
	150	5.40a	2.83a	0.00b	0.00b	124.55a	26.46a	23.56a	-22.26a	70.38b
	200	3.70a	2.50a	0.00b	0.00b	71.46a	24.46a	15.46a	-12.64a	63.59b

Salt stress had a negative effect on greenhouse grown crops, most plant performed poorly under high salt concentration (150 – 200mMol). Each cultivar except AnanasxSemame showed significant change in at least five growth parameters. Negative effects of salt stress were observed through

*Corresponding author, E-mail address: hpinarka@yahoo.com

Current Trends in Natural Sciences
Vol. 11, Issue 21, pp. 381-389, 2022
https://doi.org/10.47068/ctns.2022.v11i21.042
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

leaves yellowing and burning, wilting, stunted growth and plants death. Excess salt in plants also resulted in the restriction of cell division, elongation and stomata closure(Flowers, 2004). This observation corroborates with what was described by Machado and Serralheiro (2017), salt stress in plants usually manifests through wilting, yellowing of leaves and stunted growth. In some cultivars as it is the case of MidyatxAnanas high salt concentration (150mMol) stimulated a positive response like increase in stem diameter and leaf length (200mMol). After evaluation of several local cultivars among which Midyat and Semame, it was found that these cultivars could tolerate salinity (Kusvuran, 2019), the high performance of MidyatxAnanas is therefore justified. At minimum salt concentration (100mMol), both Semame and MidyatxAnanas had the most extended root system. This observation is contradictory, at low to moderate concentration roots are also reduced in length and mass but may become thinner (Devi & Arumugam, 2019). Though genetic inheritance from resistant parent could explain this reaction, another reason could also be that low concentration has the potential to activate some mechanisms in plants that leads to root extension.

Membrane damage index significantly increased with salt concentration, it translates salt accumulation in plant tissues, and such accumulation restricts plant growth by hindering chloroplasts functioning and photosynthesis. The presence of salt within plant cells might have affected plants ability to absorb water, thereby reducing relative water content index. Apart from Uzbek and MidyatxAnanas, significant impact of salt stress on relative water content was observed in other cultivars. Relative water content was high at high concentration in all three cultivars Semame, SemamexAnanas and AnanasxSemame. This could be because of the nature of semame which is salt resistant. In resistant varieties, relative water content tents to be high at high salt concentration (Abbasi et al., 2015). In a study on coleus plant carried out by Kotagiri and Kolluru (2017), it was reported that increase in salt concentration led to an increase in electrolyte leakage and decrease of relative water content, salt accumulation in cells caused the dead of primary leaves and the disruption of carbohydrate transportation in plants.

In in-vitro environment, increase in salt concentration did not greatly affect plants. Each cultivar encountered significant change in at most two growth parameters; Leaf diameter for Uzbek (200mMol), plant height and leaf length for SemamexAnanas (150mMol), plant height for AnanasxSemame (control) , and dry matter in stem (100mMol) and root (control) for Semame. MidyatxAnanas seemed to developed better in high salt concentration; plant height, stem diameter and leaf length gave better results than the control. Compared to greenhouse condition, in vitro grown plants appear to be more tolerant to salt stress. Moreover, there was neither significant increase of Membrane damage nor decrease in relative water content in all genotypes. There is available data that could explain in the resistance of melon plan in in-vitro condition using tissue culture technique. In another controlled environment such as hydroponic crop yield was significantly affected , salt stress led to 33% yield loss in genotypes considered as resistant and 77% in those that were sensitive (Kuşvuran, 2012). In this experiment, in vitro plant were 2-3 weeks old, this stage of development may explain their tolerance level, since plants express salt tolerance at different growing cycle. Variation in sensitivity at different growing cycles remains an obstacle in the development of salt tolerant crops, some crops may exhibit more sensitivity at grain stage than in vegetative stage (Flowers, 2004).

The relationship existing among variables was established and it was found that relative water content is significantly correlated to Membrane damage index, correlation coefficient was (r2 = 0.08). Also, plant height showed a positive significant correlation with ECI (r^2 = 0.19). However, stem and root dry matter was positive and significantly correlated to relative water content, for each

*Corresponding author, E-mail address: hpinarka@yahoo.com

Current Trends in Natural Sciences
Vol. 11, Issue 21, pp. 381-389, 2022
https://doi.org/10.47068/ctns.2022.v11i21.042
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

variable, r^2 was equal to 0.101 and 0.1127 respectively. Significant correlation was also found for leaf area with r^2= 0.41 with P<0.001. Positive and significant correlation was found between Plant vigor and relative water content, correlation coefficient was (r^2 = 0.59, p<0.05) meanwhile, r^2 = 0.097 correlation coefficient was recorded for root length and RWCI(Table 3).

Table 3. Regression analysis data of greenhouse experiment

Variables	MDI	RWCI
RWCI	0.088*	-
Stem dry matter content	0.005	0.101**
Root dry matter content	0.059	0.127**
Leaf area	0.008	0.410***
Plant height	0.193***	0.014
Stem diameter	0.007	0.048
Plant vigor	0.008	0.059*
Root length	0.006	0.097**

The relationship between variable in in-vitro condition revealed a positive and strong significant (P<0.05) correlation between stem dry matter and relative water content r^2= 0.921. Correlation between plant height and Membrane damage at P<0.05 was found positive and strongly significant r^2= 0.103, also a strong positive correlation was observed between membrane damage and stem diameter (Table 4).

Table 4. Regression analysis of in vitro experiment

Variables	MDI	RWCI
RWCI	0.003	
Stem dry matter content	0.047	0.921*
Root dry matter content	0.0005	0.022
Leaf area	0.00003	0.049
Plant height	0.103*	0.0003
Stem diameter	0.091*	0.050
Root length	0.002	0.026

At maturity, growth and physiological growth and physiological factors are more correlated, meanwhile at early stage (in-vitro) there is less correlation. This suggests that as plants develop in salty environment, physiological reactions have more impact on their external expressions. At both developmental circles membrane damage index seems to have a positive impact on plant growth, meanwhile relative water content contributes a lot in the building of dry matter content. Relative water content is an important parameter usually used to evaluate plants for resistance to abiotic stress. In our experiment, there was a positive correlation between root length and RWC; similar correlation was also found by Veesar et al.(2021) when he screened 12 cotton cultivars for drought tolerance at seedling stage. In greenhouse condition, a positive relationship between leaf area and RWC suggests that the higher the water content in plant, the larger the leaf surface area. However, negative and significant correlation between both parameters was reported in lentil plant under drought stress. High relative water content was exhibited by plants with small leaf surface area; plants with large surface area lost more water through transpiration, meanwhile water loses in those with small surface area was minimum (Mishra et al., 2018).

*Corresponding author, E-mail address: hpinarka@yahoo.com

4. CONCLUSIONS

In this experiment, five melon genotypes (two varieties and three crossing combinations) were evaluated for their tolerance to salt stress. Cultivars were grown in green house as well as in in-vitro condition where they spend respectively three months and two weeks under different salt dose treatments. The experiment revealed that salt stress affects plants growth parameters in various ways; while increase in salt concentration led to the progressive decrease of some growth parameters, the performance of others was improved at low or high salinity level, also some parameters could not be affected. It was observed that early stage melon plants were not really affected by salt stress; the application of salt concentration did not have a significant effect on most growth parameters in in-vitro condition, however as they continue growing, the negative effects of salt stress started appearing, 150 and 200mMol dose had a detrimental effect on most growth factors. Under salt stress, less correlation between morphological and physiological growth factors was observed in young plants (in-vitro), but at mature stage more correlation between the two types of growth factors was observed. After thorough evaluation, MidyatxAnanas and Uzbek appear as the cultivar the most resistant cultivars; at high salt concentration their relative water content was higher compared to other cultivars, relative water content was positive and significantly correlated to most growth factors. As a reminder, screening for salt tolerance remain a challenge because plant response to salinity depends on growth cycle, base on the results of this research it can be suggested that, resistance of melon plant (*Cucumis melo*) to salt stress must be evaluated at maturity or flowering stage, because not only significant changes of growth parameters can be detected but also because it becomes possible to perceive relationships between variables.

5. ACKNOWLEDGEMENTS

This study was produced from Erciyes University Institute of Science Ulrich Funga Master’s Thesis.

6. REFERENCES

Abbasi, G. H., Akhtar, J., Ahmad, R., Jamil, M., Anwar-ul-Haq, M., Ali, S., & Ijaz, M. (2015). Potassium application mitigates salt stress differentially at different growth stages in tolerant and sensitive maize hybrids. Plant Growth Regulation, 76(1), 111–125. https://doi.org/10.1007/s10725-015-0050-1

Deveci, M., Cabi, E., Arin, L., & Yavas, O. (2017). The effect of water deficit on some physiological properties of Abelmoschus esculentus (L .) Moench cv. “Sultani.” The Special Issue of 2nd International Balkan Agriculture Congress, 48–54.

Devi, N. D., & Arumugam, T. (2019). Salinity tolerance in vegetable crops : A review. 8(3), 2717–2721.

Flowers, T. J. (2004). Improving crop salt tolerance. Journal of Experimental Botany, 55(396), 307–319. https://doi.org/10.1093/jxb/erh003

Goutam, E., Singh, K., & Vishwakarma, G. (2020). Scientific Cultiva -. Biotica Research Today, 2(7), 580–583.

Ibrarullah, Rahman, H. U., Jilani, M. S., Gurmani, A. R., & Ullah, K. (2019). Tolerance response of muskmelon genotypes against salinity. Pakistan Journal of Agricultural Sciences, 56(1), 63–70. https://doi.org/10.21162/PAKJAS/19.6934

Karaoğlu & Yalgın (2018). Soil salinity and iğdir plain example.1(1), 27–41.

Kotagiri, D., & Kolluru, V. C. (2017). Effect of Salinity Stress on the Morphology & Physiology of Five Different Coleus Species. 10(4), 1639–1649.

Kusvuran, S. (2019). Responses of Some Melon (Cucumis sp.) Genotypes to Salt Stress. January. https://doi.org/10.1501/Tarimbil

Kuşvuran, S. (2012). Ion regulation in different organs of melon (Cucumis melo) genotypes under salt stress. International Journal of Agriculture and Biology, 14(1), 141–144.

Machado, R. M. A., & Serralheiro, R. P. (2017). Soil salinity: Effect on vegetable crop growth. Management practices to prevent and mitigate soil salinization. Horticulturae, 3(2). https://doi.org/10.3390/horticulturae3020030

*Corresponding author, E-mail address: hpinarka@yahoo.com

Mishra, B. K., Srivastava, J. P., & Lal, J. P. (2018). Drought Resistance in Lentil (Lens culinaris Medik.) in Relation to Morphological , Physiological Parameters and Phenological Developments Drought Resistance in Lentil (Lens culinaris Medik.) in Relation to Morphological, Physiological Parameters and. January. https://doi.org/10.20546/ijcmas.2018.701.277

Özbahçe, A. (2014). Influence of Limited Water Stress on Yield and Fruit Quality of Melon under Soil-Borne Pathogens. 3(1), 70–76.

Profile, S. E. E., & Profile, S. E. E. (2019). Coğrafi işaret tescilli manisa kirkağaç kavununun üretim ve ticaretinin coğrafi özellikleri [Geographical features of the production and trade of manisa centipede melon with geographical indication registration.]. January 2020.

Shrivastava, P., & Kumar, R. (2015). Soil salinity: A serious environmental issue and plant growth promoting bacteria as one of the tools for its alleviation. Saudi Journal of Biological Sciences, 22(2), 123–131. https://doi.org/10.1016/j.sjbs.2014.12.001

Thakur, H., Sharma, S., & Thakur, M. (2019). Recent trends in muskmelon (Cucumis melo L.) research: an overview. Journal of Horticultural Science and Biotechnology, 94(4), 533–547. https://doi.org/10.1080/14620316.2018.1561214

Ulas, A., Aydin, A., Ulas, F., Yetisir, H., & Miano, T. F. (n.d.). Cucurbita Rootstocks Improve Salt Tolerance of Melon Scions by Inducing Physiological , Biochemical and Nutritional Responses. 1–13.

Veesar, N. F., Jatoi, W. A., Channa, Q. A., Memon, S., Gandahi, N., Aisha, G., Jatoi, T. A., Maitlo, W. A., Solangi, A. H., & Rajput, L. (2021). Evaluation of cotton genotypes for drought tolerance and their correlation study at seedling stage. Fresenius Environmental Bulletin, 30(5), 5015–5025. https://doi.org/10.26717/bjstr.2020.29.004738

Zong, L., Tedeschi, A., Xue, X., Wang, T., Menenti, M., & Huang, C. (2011). Effect of different irrigation water salinities on some yield and quality components of two field-grown Cucurbit species. Turkish Journal of Agriculture and Forestry, 35(3), 297–307. https://doi.org/10.3906/tar-0908-5

*Corresponding author, E-mail address: hpinarka@yahoo.com