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Growth performance and sensitivity index of two types of melon under salinity stress on Bengkulu Coastal Land

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Abstract Merlin and Melindo are two melon genotypes that have not gotten the legal but inhibiting for 2 weeks after treatment at a concentration of 6000 ppm. The Merlin genotype was able to suppress up to 6000 ppm. The leaf greenness of Melindo persisted until the fourth week at a concentration of 10000 ppm. The concentration of 6000 ppm showed the Merlin and Melindo genotype sensitivity index. The results showed that two genotypes are still classified as sensitive.

Keywords: Concentration, Tolerance, Salinity index

Introduction

Melon is a type of horticultural fruit that is favored among people. Melon is consumed in fresh or processed forms, such as salads, soups, curries, stir-fries, jams, and syrups (Milind and Kulwant, 2011). The preference for melons is based on taste, freshness, and sweetness (Lester, 2006; Saputra *et al*., 2022). People who like melons accounted for up to 22% and tripled their consumption of melons in one month (Rolim *et al.*, 2020). It has the potential to be developed that melons produce fruit rapidly, have high economic and relatively stable prices, and increase market demand. Based on BPS (2021), melon production in 2019 was 122,105 tons, an increase of 11.63% in 2020 (BPS, 2021). Increasing national production data is inseparable from the contribution of each province. Bengkulu province contributed 256 tons of melons in 2019, rising to 696 tons in 2020. Compared to the national number, this is still far away. This case is a great opportunity to increase melons' quantity and quality. Various efforts have been made to develop melon plants to meet consumer needs, such as using marginal land through plant breeding programs.

Sand land is included in marginal land that has low quality because of the limiting factor to be used in agricultural cultivation (Yuwono, 2009). Bengkulu

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Province has a coastal area with a coastline of 17.22 km (Zamdial *et al*., 2018). From this opportunity, Bengkulu has the potential to take advantage of coastal land. Some advantages of sandy land for agricultural area development are slope (2-8%), free of flooding, abundant sunlight, shallow groundwater, and easy processing. However, coastal land has drawbacks, namely the presence of high salt content, which causes plant growth inhibition such as osmotic stress, nutrient imbalance, certain ion toxicity, and oxidative stress (Kristiono *et al*., 2013; Karolinoerita and Annisa, 2020).

There are many ways to deal with saline land, namely periodic fertilizer application as a soil enhancer, construction of drainage channels to separate water containing saline levels, and assembling varieties in saline land (Pranata and Kurniasih, 2019; Nasyirah *et al*., 2015; Wang *et al*., 2018). Under saline conditions, plants would continue metabolizing even though cells and tissues are stressed. This mechanism is known as tolerance, characterized by capable plants so that plant growth and development are not disturbed much. Intolerant conditions, plants also try to prevent Na/Cl ion poisoning (Marschner, 1986). Superior varieties of melons will be formed if the plants adapt to saline stress. Saline-tolerant varieties will produce high proline content (Sobir *et al.*, 2018), high free amino acids, and low decrease in chlorophyll (Salwa *et al.*, 2010), and can excrete Na (Smitharani *et al*., 2014). The purpose was to obtain information about the right salt concentration for selection and to obtain information on different salt concentrations based on the melon type.

Materials and methods

The research was conducted from May to June 2021 at the Agronomy Laboratory Greenhouse, Faculty of Agriculture, at an altitude of ± 10 m above sea level. The study used a factorial Randomized Complete Block Design (RCBD). The first factor was the type of melon, namely melon net/Merlin (M1) and melon without net/Melindo (M2). The second factor was the salt concentration, namely 0 ppm (K1), 2000 ppm (K2), 4000 ppm (K3), 6000 ppm (K4), 8000 ppm (K5), 10000 ppm (K6), 12000 ppm (K7). These two factors formed 14 treatment combinations. Each treatment combination was repeated thrice; the total experimental units were 52. Planting was carried out on planting media using Bengkulu beach sand soil which was filled into polybags with dimensions of 25 x 25 cm, then put into a container with dimensions of 40 x 32 x 12 cm, which contained AB mix solution as nutrients and salt solution according to the treatment concentration.

Variables observed were plant height (cm), leaf length (cm), leaf width (cm), number of leaves, leaf greenness (unit), root wet weight (g), root dry weight (g), and canopy wet weight. (g), canopy dry weight (g). Data were analyzed using variance. If the 5% variance had a significant effect, it was continued with the Tukey test. The measurement of the sensitivity index (S) of NaCl salt stress calculated according to Fischer and Maurer (1978) is by using the formula:

$$S = \frac{[1-\frac{Y}{Yp}]}{[1-\frac{X}{Xp}]}$$

Y = The average value of certain variables in one genotype experiencing NaCl salt stress
Yp= The mean value of certain variables in one genotype in the optimum environment (control)
X = The average value of a certain variable in all genotypes that experience NaCl salt stress
XP = The mean value of certain variables on all genotypes in the optimum environment.

The genotype is said to be tolerant if it has an S value < 0.5, moderately tolerant if 0.5 S 1, and sensitive if S > 1.

Results

Growth two melon genotypes and salt concentration treatment

The results showed that genotype and salt concentration had significantly affected almost all observed melon plant growth variables. The result of genotype interaction with salt concentration significantly affected the variables of leaf greenness, root wet weight, root dry weight, leaf length, and leaf width (Table 1).

Effect of different salt concentrations in two melon varieties

The salt content affected the growth of melon plants. The higher concentration inhibited plant growth (Table 2). Concentrations without treatment showed no effect on the growth factors of the two types of melons. Furthermore, 2000 ppm (K1) and 4000 ppm (K2) did not affect two melon genotypes. Concentrations of 6000 ppm, 8000 ppm, and 10000 ppm significantly affected melon growth (Table 2). The best performance of plant height, leaf greenness, and number of leaves are Melindo, whereas leaf length, width leaf, and root wet weight are Merlin (Figure 1).

Table 1. Growth two melon genotypes and salt concentration treatment

Variable	Treatment						CV
	Genotype		Salt concentration		Interaction		
KH1	194.15	**	14.87	ns	17.23	ns	10.43
KH2	9.76	ns	42.63	**	16.90	*	8.70
KH3	18.80	ns	192.43	**	110.84	**	8.07
KH4	154.10	**	393.94	**	94.55	**	9.36
KH5	42.84	*	901.55	**	28.83	*	17.26
KH6	1.74	ns	1316.35	**	30.07	ns	8.52
BBT	1.32	ns	16082.02	**	379.11	ns	31.34
BKT	0.57	ns	101.65	**	0.26	ns	32.97
BBA	31.91	**	199.41	**	61.15	**	50.79
BKA	0.01	ns	3.59	**	0.32	**	49.55
PA	1.45	ns	45.61	**	15.61	ns	13.67
TT1	238.57	**	0.97	ns	0.65	ns	23.76
TT2	118.68	**	7.25	ns	5.08	ns	21.51
TT3	59.76	ns	675.45	**	38.28	ns	36.72
TT4	21.29	ns	5259.04	**	45.05	ns	25.64
TT5	403.62	ns	12805.42	**	137.20	ns	19.20
TT6	431.36	ns	19928.19	**	268.91	ns	18.78
JD1	1.93	**	0.10	ns	0.10	ns	30.52
JD2	0.00	ns	0.65	*	0.56	ns	17.77
JD3	2.88	**	10.41	**	0.38	ns	12.97
JD4	30.86	**	44.87	**	0.41	ns	12.08
JD5	69.43	**	119.13	**	2.71	ns	13.76
JD6	69.43	**	221.49	**	2.87	ns	12.52
PD1	3.90	*	0.35	ns	0.89	ns	15.80
PD2	13.26	**	3.71	**	0.75	*	9.67
PD3	1.97	ns	7.75	**	1.09	ns	12.59
PD4	3.15	*	14.52	**	2.53	**	0.67
PD5	30.86	**	26.48	**	7.96	**	16.56
PD6	42.00	**	1.63	**	5.10	**	14.00
LD1	3.84	*	0.12	ns	1.13	ns	18.02
LD2	5.50	*	4.34	**	1.33	ns	14.78
LD3	0.12	ns	23.77	**	1.82	ns	15.25
LD4	0.36	ns	20.76	**	5.66	**	14.06
LD5	23.48	**	30.68	**	16.56	**	16.18
LD6	70.98	**	3.84	**	7.40	**	17.35

Note: KH= greenish leaf, BBT=wet weight of crown, BKT=dry weight of crown, BBA=wet weight of root, BKA=dry weight of root, PA=length of root, TT=plant height, JD=number of leaves, LD=width of leaf ; 1-6=Sunday; *=significantly significant, **=very significant effect, ns=not significant

Table 2. Different salt concentrations to the growth of melon genotype

Variable	K0	K1	K2	K3	K4	K5	K6
Greenness of the leaves 2	29.63 bc	31.01 bc	33.48 abc	35.35 abc	35.6 ab	36.43 ab	31.15 bc
Greenness of the leaves 3	29.58 b	33.45 b	34.46 b	47.75 a	40.78 a	43.73 a	30.75 b
Greenness of the leaves 4	32.58 b	38.53 ab	42.98 a	42.75 a	40.95 a	38.36 ab	20.06 c
Greenness of the leaves 5	36.48 b	45.30 a	45.55 a	43.69 a	34.93 b	28.73 c	11.18 d
Greenness of the leaves 6	41.66 a	42.58 a	41.35 a	31.85 b	19.90 c	14.75 cd	6.01 d
Header wet weight (g)	146.32 a	67.21 b	42.86 c	21.00 cd	8.86 c	4.83 d	1.46 d
Header dry weight (g)	12.05 a	6.48 b	4.06 bc	3.00 cd	1.67 cd	0.81 de	0.81 de
Root wet weight (g)	16.66 a	7.28 b	5.69 bc	2.51 cd	1.33 cd	0.86 d	0.42 d
root dry weight (g)	2.27 a	0.99 b	0.74 bc	0.36 bc	0.22 cd	0.14 cd	0.09 d
Root length (cm)	24.83 a	22.21 ab	19.78 bc	19.31 bc	19.25 bc	18.51 bc	16.25 c
Plant height 3 (cm)	32.95 ab	34.41 a	20.25 bc	19.76 bc	13.96 c	10.38 c	6.91 c
Plant height 4 (cm)	83.23 a	71.15 a	41.95 b	31.46 bc	17.40 cd	12.40 d	7.51 d
Plant height 5 (cm)	128.23 a	100.47 a	58.30 c	38.73 d	21.20 e	13.43 e	7.33 e
Plant height 6 (cm)	159.32 a	119.50 b	69.30 c	45.85 d	23.36 e	13.43 e	7.33 e
Number of leaves 2	3.16 a	3.00 ab	2.83 ab	2.66 ab	2.50 ab	2.66 ab	2.16 b
Number of leaves 3	6.16 a	5.83 a	5.16 ab	5.16 ab	4.16 bc	3.5 cd	2.5 d
Number of leaves 4	10.00 a	8.83 ab	7.8 b	6.16 c	4.66 d	4.00 d	2.5 e
Number of leaves 5	15.5 a	12.50 b	9.66 c	8.00 cd	6.00 de	5.00e	2.66 f
Number of leaves 6	19.83 a	15.50 b	10.83 c	9.33 c	6.16 d	5.00 e	2.66 f
Leaf length 2 (cm)	6.66 a	6.48 a	5.85 ab	5.76 ab	5.71 ab	4.9 bc	4.46 c
Leaf length 3 (cm)	8.13 a	7.56 ab	7.25 ab	6.62 abc	6.51 bcd	5.3 cd	5.06 c
Leaf length 4 (cm)	9.13 a	7.89 ab	7.50 b	7.05 b	6.6 bc	5.15 cd	4.61 d
Leaf length 5 (cm)	9.75 a	7.86 b	6.7 bc	3.96 d	4.75 d	4.46 d	5.3 cd
Leaf length 6 (cm)	4.93 a	4.73 ab	4.61 ab	3.61 b	4.80 ab	4.46 ab	5.30 a
Leaf width 2 (cm)	7.33 a	7.10 a	6.68 a	6.68 a	7.03 a	5.96 ab	4.86 b
Leaf width 3 (cm)	10.65 a	10.05 ab	9.71 ab	9.00 ab	8.00 bc	6.31 cd	5.33 d
Leaf width 4 (cm)	10.60 a	9.43 ab	8.90 ab	8.33 b	7.67 cd	5.91 cd	5.43 d
Leaf width 5 (cm)	10.78 a	9.15 ab	8.10 b	5.43 c	5.40 c	5.36 c	5.30 c
Leaf width 6 (cm)	8.80 a	5.90 b	5.53 ab	5.43 ab	5.40 ab	5.36 ab	3.93 b

Note: Numbers followed by the same letter in the same column are not significantly different based on Tukey at level =5%. 0 ppm (K0), 2000 ppm (K1), 4000 ppm (K2), 6000 ppm (K3), 8000 ppm (K4), 10000 ppm (K5), 12000 ppm (K6)

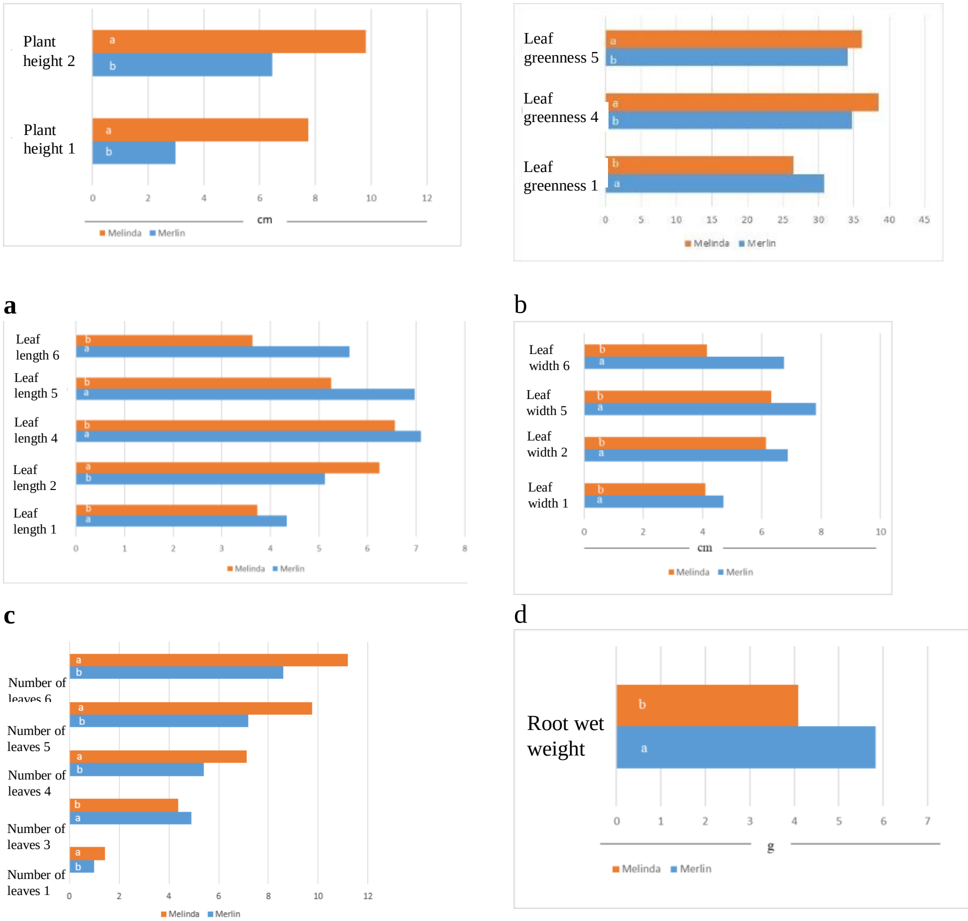

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Figure 1. Growth diagram of two melon genotypes (Melindo and Merlin) under saline stress; a) plant height, b) leaf greenness, c) leaf length, d) leaf width, e) number of leaves, and f) root wet weight; the same letter shows no significant difference based on Tukey's test at level =5%. 0 ppm (K0), 2000 ppm (K1), 4000 ppm (K2), 6000 ppm (K3), 8000 ppm (K4), 10000 ppm (K5), 12000 ppm (K6)

The appearance of interaction between salt concentration and genotype of melon

Salt concentration and genotype have interaction on appearance two genotypes melon.

Table 3. The appearance of greenish leaves, root wet weight, and root dry weight of two melon genotypes on the interaction between salt concentration and genotype on coastal land

KG / Genotipe	Greenness of the leaves 1		Greenness of the leaves 2		Greenness of the leaves 3		Greenness of the leaves 4		Root wet weight		root dry weight (g)	
	G1	G2	G1	G2	G1	G2	G1	G2	G1	G2	G1	G2
K0	25.27 b	26.63 ab	28.00 b	31.27 ab	26.43 de	32.73 de	29.33 cd	35.83 abcd	24.67 a	8.66 b	2.76 a	1.79 ab
K1	29.10 ab	26.83 ab	31.00 ab	31.03 ab	32.20 de	34.70 cde	33.13 bcd	43.93 a	6.67 bcd	7.90 bc	0.84 bcd	1.14 bc
K2	31.97 ab	25.57 b	34.37 ab	32.60 ab	33.30 de	35.63 cd	41.97 ab	44.00 a	4.67 bcd	6.73 bcd	0.50 cd	0.99 bcd
K3	30.87 ab	27.80 ab	34.87 ab	35.85 ab	45.50 a	38.00 abcd	43.17 a	42.35 abcd	1.67 bcd	3.35 bcd	0.34 cd	0.39 cd
K4	34.93 a	26.37 ab	36.23 ab	34.97 ab	44.87 ab	36.70 bcd	42.60 ab	39.30 abc	1.33 bcd	1.33 bcd	0.21 cd	0.24 cd
K5	33.60 ab	26.40 ab	37.36 a	35.50 ab	45.07 ab	42.40 abc	40.93 ab	35.80 abcd	1.33 bcd	0.39 d	0.17 cd	0.13 d
K6	29.73 ab	25.77 b	27.47 b	34.83 ab	22.47 ef	39.03 abcd	11.70 e	28.43 d	0.54 cd	0.31 d	0.11 d	0.07 d

Note: 0 ppm(K0), 2000 ppm (K1), 4000 ppm (K2), 6000 ppm (K3), 8000 ppm (K4), 10000 ppm (K5), 12000 ppm (K6); Merlin/net (G1), Melindo/without net (G2)

Table 4. The appearance of leaf length and width of 2 melon genotypes on the interaction between salt concentration and genotypes on coastal land

KG / Genotipe	Leaf lenght 2 (cm)		Leaf lenght 5 (cm)		Leaf lenght 6 (cm)		Leaf width 4 (cm)		Leaf width 5 (cm)		Leaf width 6 (cm)	
	G1	G2	G1	G2	G1	G2	G1	G2	G1	G2	G1	G2
K0	7.40 a	5.93 abcde	9.33 ab	10.16 a	5.83 abc	4.03 cdef	9.43 abc	11.77 a	9.33 ab	12.2 a	7.93 ab	5.27 bcde
K1	6.90 ab	6.03 abcd	8.23 abc	7.50 bcd	5.50 abc	3.97 cdef	8.53 abcd	9.27 abc	8.90 ab	9.4 ab	6.90 abcd	4.90 cdef
K2	6.80 abc	4.63 de	8.30 abc	5.10 def	6.07 abc	3.17 def	9.40 abc	9.47 abc	9.10 ab	7.1 bcd	7.17 abc	3.90 efg
K3	6.60 abc	5.10 cde	5.60 cde	2.33 f	4.73 bcd	2.50 f	9.93 ab	6.73 bcde	7.90 bc	2.7 ef	5.73 abcde	2.13 g
K4	6.00 abcd	5.53 bcde	7.00 bcd	2.50 f	7.00 a	2.60 ef	8.47 abcd	6.87 bcde	8.40 b	2.47 f	8.40 a	2.47 fg
K5	5.57 bcde	4.23 e	5.83 cde	3.10 ef	5.83 abc	3.10 def	6.53 bcde	5.30 de	6.50 bcd	4.3 def	6.50 abcde	4.30 defg
K6	4.50 de	4.43 de	4.50 def	6.10 cde	4.50 bcde	6.10 ab	4.63 e	6.23 cde	4.63 cdef	6.1 bcde	4.63 cdefg	6.10 abcde

Note : 0 ppm(K0), 2000 ppm (K1), 4000 ppm (K2), 6000 ppm (K3), 8000 ppm (K4), 10000 ppm (K5), 12000 ppm (K6); Merlin/net (G1), Melindo/without net (G2)

Salinity index of two genotypes melon in growth phase under salt treatment

Salinity index analysis showed that all characters in growth phase are sensitive groups except leaf length and leaf width.

Table 5. Sensitivity index of Merlin and Melindo at 4000 ppm concentration

Variable	Melon group			
	Merlin	group	Melindo	group
Greenness of the leaves	3.669	sensitive	1.809	sensitive
Plant height (cm)	1.899	sensitive	2.292	sensitive
Number of leaves	1.451	sensitive	1.603	sensitive
Leaf length(cm)	-2.658	tolerant	-5.359	tolerant
Leaf width	-7.844	tolerant	0	tolerant
Head wet weight (g)	2.331	sensitive	2.064	sensitive
canopy dry weight (g)	2.047	sensitive	1.954	sensitive
Root wet weight (g)	4.445	sensitive	2.921	sensitive
Root dry weight (g)	2.747	sensitive	2.448	sensitive
Root length(cm)	2.559	sensitive	1.049	sensitive

Discussion

Salinity affects almost all physiological and biochemical aspects of plants, thereby reducing growth and yield (Kristiono *et al*., 2013). Oliveira *et al*., 2022 reported that a high concentration of salicylic acid (4.5 mM) intensified the harmful effects of the salinity of the nutrient solution on gas exchange and fresh weight of hydroponic melon. Melon plants grow normally until the second week. However, in the third and fourth weeks, the plants showed symptoms of saline stress. It is suspected that the high salt content causes the pH to decrease, thus affecting the ability of the roots to absorb nutrients. The increasing salt content in the soil causes an increase in the solubility of Na, Ca, Mg and Mn, while the solubility of K, metabolism of N content, and soil pH tend to decrease (Suriadikarta, 2005; Khan *et al.*, 2010).

Plants that were given a concentration of 2000 ppm to 4000 ppm remained showed normal growth in the greenness of the leaves, the number of leaves and leaf length until week 3, and leaf width. Plant growth began to be abnormal at concentrations of 6000 ppm, 8000 ppm, and 10000 ppm, except for greenish leaves in the fourth week. Normal plant height is 159.32 cm, while at a concentration of 6000 ppm, the plant height is 45 cm, the concentration of 8000 ppm is 23 cm, and the concentration of 10000 ppm is 13.43 cm. The higher the salt concentration, the shorter the plant height. A concentration of 6000 ppm NaCl also can inhibit plant height on *Cucurbita moschata* (Sari *et al.*, 2022).

The greenness of the melon leaves still looks the same as without treatment until the fourth week. The highest concentration, 12000 ppm, has inhibited all variables of melon plant growth. Related Rasmia (2014) reported that concentration salts 14000 ppm NaCl significantly can decrease chlorophyll a and b. The greenness of the leaves is closely related to the chlorophyll content. The formation of chlorophyll requires nutrients Mg, N, and Fe. Plants that experience NaCl stress cause Mg and Fe elements to be bound, so they are not available to plants (Yiu *et al*., 2012).

Genotype ability is important in overcoming environmental stresses (Ganefianti *et al*., 2019). From these two genotypes, the differences between the two genotypes were significantly different. The best variable for plant height, leaf greenness, and the number of leaves was Melindo, while the variables for leaf length, leaf width, and root wet weight were the Merlin genotype. Each genotype can maintain its metabolic processes under saline stress.

The salt concentration and genotype interaction significantly differed from the observed variables. Leaf greenness levels at week 1 and week 2 still looked the same in both genotypes. Entering the third week, changes in the greenish level of the leaves began to appear at each different salt concentration. Leaf color was still green until the fourth week at a concentration of 10000 ppm, which was relatively high, especially in the Merlin genotype, which was stable from the first week. The Melindo genotype maintained its greenish leaves only at a concentration of 4000 ppm. The chlorophyll content in the leaves that still survived was in the first week of Merlin, with a concentration of 8000 ppm with a greenish level of 34.93. In the second week, the greenness of the leaves increased by 37.36 at a concentration of 10000 ppm. Dababat (2015) reported that the recommendation of salt concentrations for melon range between 2000 to 3000 ppm.

The concentration of 6000 ppm showed the best greenish level at week 3 (45.50), and week 4 (43.17) was Merlin. However, it was not significantly different at a concentration of 10000 ppm. The best greenness level of the Melindo was concentrations of 2000 ppm and 4000 ppm, while the Merlin genotype maintained the green color of the leaves even under conditions of high salt stress. Distribution of NaCl, as much as 5000 ppm to 7500 ppm, can inhibit chlorophyllase activity, thereby reducing leaf chlorophyll content (Rahmawati *et al*., 2013). In a similar study, Yarsi *et al.,* 2017 reported that Salinity stress decreased chlorophyll a, chlorophyll b and carotenoid contents of both grafted and un-grafted plants.

Nevertheless, Merlin showed a higher weight for these two variables regarding root wet and dry weight. However, being given salt treatment, both melon genotypes showed the same low wet and root dry weights. This indicates that the Cucurbitaceae plant group is moderately sensitive to salinity stress, especially during germination and early vegetative growth (Yamika *et al.,* 2015). This happens because the roots cannot actively absorb water. After all, the osmotic pressure in the root area is lower (Pranasari *et al.,* 2012). Under salt stress, plant roots decreased significantly (Giancarla *et al*., 2015). Krismiratsih *et al.* (2020) stated that rice plants subjected to 4 dS m-1 salt stress showed a decrease in desiccating and root dry weight. Sarabi *et al.* (2017) also revealed that 30, 60, and 90 mM NaCl caused a distinct adverse effect on biomass with 16.8%, 28.2% and 41.5% reductions, respectively.

The length and width leaf of the Merlin on the second week without salt concentration showed the highest value of 7.40 cm, but it was not significantly different from that given the treatment up to 8000 ppm. Likewise, for the Melindo genotype but only up to a concentration of 6000 ppm. At week 5, leaf length and width still had the same pattern, only at high concentrations that the length and width of the leaves were not the same as the plants without treatment. Entering week 6, the best length (7 cm) and leaf width (8.40 cm) were in the Merlin genotype with a concentration of 8000 ppm. At the highest concentration, leaf length and width experienced salt stress, but at week 6, the Melindo genotype showed no significant difference in leaf size without treatment.

The vegetative phase is the right time to classify tolerance criteria (Wang *et al.,* 2020). Entering the generative phase, the stress on plants will stop (Sacita, 2016). A salt concentration of 6000 ppm is classified as high (Hussein *et al*., 2014). The concentration of 6000 ppm showed a difference with the melon genotype without salt concentration. This concentration of 6000 ppm was tested on several UNIB-assembled melon genotypes.

A concentration of 6000 ppm can reduce root dry weight and slow down harvest time (Mousa *et al*., 2013; Sadatshojaei *et al*., 2016). Calculating the sensitivity index to saline stress was used to obtain the tolerance level of plant genotypes. Based on the analysis of the saline stress sensitivity index of the growth phase, the difference in salt concentration for the meshed melon (Merlin) and the non-netted (Melindo) type showed the same response. The value of the sensitivity index of the Merlin and Melindo genotypes was sensitive to 8 growth characters, except for tolerant leaf length and width characters. Plants that are sensitive to stress will reduce leaf area and enzyme activity of CAT (Catalase) and APX (Ascorbate Peroxidase) (Islam *et al*., 2015).

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