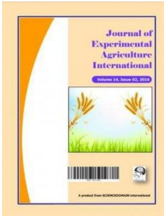

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Evaluation of Melon Plant Grown in Saline Environment

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Author's contributions

The authors IDEC, PVF, MGP, JVSN, ABSJ, DSF, MTS and CCAP designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

The melon plant is one of the plants with agronomic potential adult among the vegetables, for presenting high productivity in a short time. In Brazil the main producing areas are located in the owed semiarid the favourable conditions of climate for the culture, however, that area presents some factors limitations, mainly as the salinity of the soil and of the water, what carts in the decrease in the productivity and in certain cases total loss of the cultivation. The objective of that work was to accomplish a growth analysis in cycles of melon plant selection developed in a saline environment. The experiment was executed from March to May of 2017 in the Federal University of Alagoas. The appraised treatments were six cycles of melon plant (C1, C2, C3, C4, C5a and C5b) selection. The used design was in randomized complete block design in subdivided portions, being the six selection cycles the portions and the six evaluations biometrics in the time the subplots, with four repetitions. The subplots were divided into two stages in agreement with the presence of the characteristic in the vegetative stage of the plant, in that were appraised vegetative and reproductive variables. Variance analysis and test were accomplished from Tukey to 5% of probability, besides the obtaining of the earnings for selection. To determine the variable of larger

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importance the technique of main components it was used. Among the cycles C1 and C5a there was an increase of 15,89% of the number of leaves, that is due mainly for the small ones won to each election cycle. The selection cycles accomplished in the melon plant population promoted a small reduction in the percentile of matter dries to each selection cycle, not presenting significant difference among the cycles, with averages of 13,92; 13,10; 13.05; 12,62; 11,94 and 12,28%, respectively for the cycles C1, C2, C3, C4, C5a and C5b. NL and NFB explain about 85% of the total variation found among the selection cycles. NL presented the largest importance in the vectors and it presented correlation with several characteristics, like LMS (0.99), LSS (0.90), NBFF (0.80) and % MSPA (0.91). The selection cycles presented genetic progress as the tolerance the salinity. The number of leaves is the characteristic to be selected for obtaining of tolerant superior genotypes the salinity.

Keywords: Cucumis melo L; mass selection; flowering; salinity.

1. INTRODUCTION

The melon production is mainly an agricultural activity of prominence in the Brazilian Northeast in the areas semiarid, due to the characteristics climate and soil characteristics, as low humidity of the air, soils light, big extensions of arable soil among other factors, collaborating for the quantitative and qualitative increase of the product [1]. According to data of [2], since 1994 there is considerable growth in the Brazilian production, as a consequence of the increase of the cultivation area and mainly improvements in the cultivation. In spite of adaptability for to the edaphoclimatic conditions of the Northeast Area, the cultivation of the melon plant in the Northeastern semiarid, is in risk, due to problems with the salinity of the water and of the soil, that can harm the productivity and quality of the fruits [3].

In the areas of climate semiarid one of the great adverse factors for the agricultural production is the salinity, due to the formation of shallow soils and high temperatures that promote the accumulation of salts in the surface of the soil. That is a natural process, however, intensified by the human actions, as irrational use of the irrigation and use of salty water in the same, so that once the soil saline the desalination process is economically unviable and in that way, it turns inappropriate the use of the area for agriculture [4].

For saline soils or use of saline water in the irrigation and hydroponic the best alternative is to cultivate genotypes that present larger adaptation to the substratum with that characteristic, time that the practices that reduce the tenor of salts need many resources. With the use of you cultivate tolerantly the allied salinity to appropriate handling is possible to obtain high productive and qualitative incomes [5].

The melon plant is considered a species middling tolerant the salinity, possessing variation among genotypes, so that even certain limits are possible in a saline substratum to obtain fruits of high quality, but due to the continuous process of salinization usually happens losses of vegetative growth and productivity [4].

The effect of the salinity on the plants is a consequence of two different components of the saline stress: (1) the osmotic component: resulting from the high concentration in the solution, provoking a water deficit for the reduction of the osmotic potential; (2) the ionic component: Due to the high tenors of Na^+ and Cl^-, and of the altered relationship K^+ / Na^+ and other nutritious [6].

The caused damages the plants for the salinity begin from the germination to the production of the fruits so that the growth is one of the indicative more used to quantify the saline effect in the melon plant [7,8,9]. For the development of you cultivate of tolerant melon the salinity the genetic earnings are low as a consequence of the great number of genes involved in the characteristic, a successful example is the melon variety BG84-3, developed in Israel, in the decade of 90, using the natural selection of ecotype [10].

Owed the difficulties in the development of you cultivate tolerant the salinity, is usually used simple methods of selection, as mass selection, time that to each progress in the selection cycles the favourable genes the tolerance the salinity is maintained in the population and to each cycle the frequency phenotypic increases, like this, even with little tax of won to each cycle is possible to obtain upper genotype [5]. In the case of hybridization methods, it happens the problem of also to transfer undesirable characteristics, mainly in the case of the melon that present several botanical groups with different characteristics and usually the main genes of tolerance are in groups little explored economically. The quantitative genetics of yield and yield-related traits in melon under non-saline conditions have been extensively studied [11].

That work had as objective accomplishes a growth analysis in cycles of a selection of melon plants developed in the saline atmosphere.

2. MATERIALS AND METHODS

2.1 Experimental Location

The experiment was executed from March to May of 2017 in the Section of Genetic Improvement of Plants of the Center of Agrarian Sciences of the Federal University of Alagoas - Campus Delza Gitaí, BR 104 North, km 85, located in the Municipal district of Rio Largo, State of Alagoas, located the 9°27' of south latitude and 35°27' de longitude west and 127 m of altitude. The experiment was installed in greenhouse, covered with a translucent roof, allowing the passage of 50% of the light.

2.2 Treatment Procedure

The appraised treatments were six cycles of melon plant (C1, C2, C3, C4, C5a and C5b) selection starting from the population PM1 with the following characteristics: fruits with format varying flat (CL CT) to oval (CL > CT), without ribs, without tracing, of color yellows (all of the shades) and size varying of small the medium, which was resulting from the crossing of the you cultivate yellow gold (I group botanical Inodorus) and Hale's Best (I group botanical Reticulatus), that starting from the generation F2 the plants selected individually were driven through means siblings' progenies to the generation F6, where they were characterized and contained in function of the fruit characters: I format, ribs, tracing, color and size, giving referred origin her population. The selections of the cycles C1, C2, C3, C4 and C5a happened in the municipal district of São José da Tapera - AL and the cycle C5b happened in the municipal district of Água Branca - AL, being the two cycles derived C5 of the cycle 4. In the two selection atmospheres, the cultivation areas presented high concentrations of salts, with electric conductivity (CE) varying from 4.0 to 7.0 $dS.m^{-1}$.

The melon seeds were sowed directly in the sacks of polyethylene with capacity for 10 L, 4 seeds for sack, after the germination happened the rough-hewing, just leaving a plant for sack. The sacks contained a mixture of soil ¾ and ¼ of washed sand. The texture of the soil after the mixture average was considered, with 33.8% of clay, 1.1% of silte, 46.3% of sand die and 18.8% of thick sand. The chemical composition was ph. 5.7; In the -25 ppm; P. 55 ppm; K. 37 ppm; Ca+ mg 5.6 meq/100 ml; Here. 3.2 meq/100; Mg. 2.4 meq/100; Al 0.03 meq/100; H + Al. 3.6 meq/100; S.B. 5,8 meq/100; CTC. 9.4 meq/100; V. 56.7%; m 0.5% and M. The 1.98%.

The manuring was accomplished in foundation, 3 g of N (Ureia), 4 g of P (Super Simple Phosphate) and 2 g of K (Chloride of Potassium) and he/she saw fertigation every 4 days starting from the 15 days after the sowing, with a solution with the following composition for 2000 L of water: 883 g of Nitrate of Calcium, 550 g of Nitrate of Potassium, 220 g of MKP, 450 g of Sulfate of Magnesium, 25 g of Quelatec®, 25 g of Ultra Ferro and 1,80 g of boric acid, diluted in 130 ml of H2O. CE of that solution was about 1,2 $dS.m^{-1}$. The pH of this solution ranged from 6.2 to 6.3. In the intervals between the days of fertigation irrigation with water in the electrical conductivity of 0.1 $dS.m^{-1}$ (± 0.05) was performed. The amount of water and of the solution in the fertigations varied at the beginning of the cycle of 150 ml / it plants to 1500 ml / it plants at the end of the cycle, that last one being fractioned in three times during the day, avoiding the leaching of the salts.

CE of the soil was measured after the extraction of the solution of the soil through the saturated paste, following the methodology proposed by [12]. CE of the soil was of 1,9 dS.m-1 (± 0.21), being increased Chloride of Sodium (NaCl) to reach CE of 7.0 dS.m-1 (± 0.20). At the end of the cultivation, CE was quantified again, presenting 6.6 dS.m-1 (± 0.20).

During the execution of the experiment, the relative humidity of the air varied from 60 to 80%, with an average of 68.7% and the temperature varied from 21 to 39°C, between the night period and the period of maximum temperature, expressed in the Fig. 1 (Fig. 1). During the periods in that the selection cycles were accomplished, among the years from 2012 to 2015 the minimum medium temperatures, maximum averages and general averages are in Table 1.

The precipitations during the selection periods are exposed in the Fig. 2.

The used delineamento was in blocks at random in subdivided portions, being the six selection cycles the portions and the six evaluations biometrics in the time the subplots, with four repetitions. The subplots were divided into two stages in agreement with the presence of the characteristic in the vegetative stage of the plant. Each experimental unit was composed of 10 sacks of polyethylene.

2.3 Experimental Design

The experiment was driven in the system of free vertical transport, in that to main stems was driven vertically and the stems secondary horizontally. The control of insects curses was accomplished for the white (Bemisia argentifolii) fly with two applications (15 and 30 days) of Mospilan® (250 g p.c / ha) and drill of the curcubitáceas (Diaphania nitidalis Cramer) was controlled with an application (43 days) of Decis® (30 ml/100L of water). The control of disease was accomplished with two applications (25 and 50 days) of the fungicide Cercobim® (70 g p.c / ha) for oídio (Sphaerotheca fuliginea) control.

The appraised characteristics to the 15, 23, 31, 39, 47, 55 and 63 days after the planting (DAP) they were: the length of the main stem (LMS), is measured with measuring tape of the lap to the apical meristema; medium length of the first two secondary stems (MLS), measured starting from the insert in the main stem until the apex; Area to foliate dear through the equation y = 0,826 x 1,89 (R^2 = 0,97), in that y corresponds the area to foliate and x the medium width of the leaves [13]; Number of leaves, accomplished starting from the counting of the true leaves.

The appraised characteristics to the 39, 47, 55 and 63 DAP were: number of floral buttons, number of masculine flowers, number of feminine flowers and medium number of fruits (larger than 5 mm of traverse diameter), all obtained through the counting, being the first two taking into account the difference of flowers among the counting of the previous evaluation. The matter dries (MD) was evaluated to the 63 days DAP, in that it was taken as sample four plants of each portion, heavy through digital scale, in the sequence the plants were put in flow greenhouse the temperature of 72°C to reach constant weight.

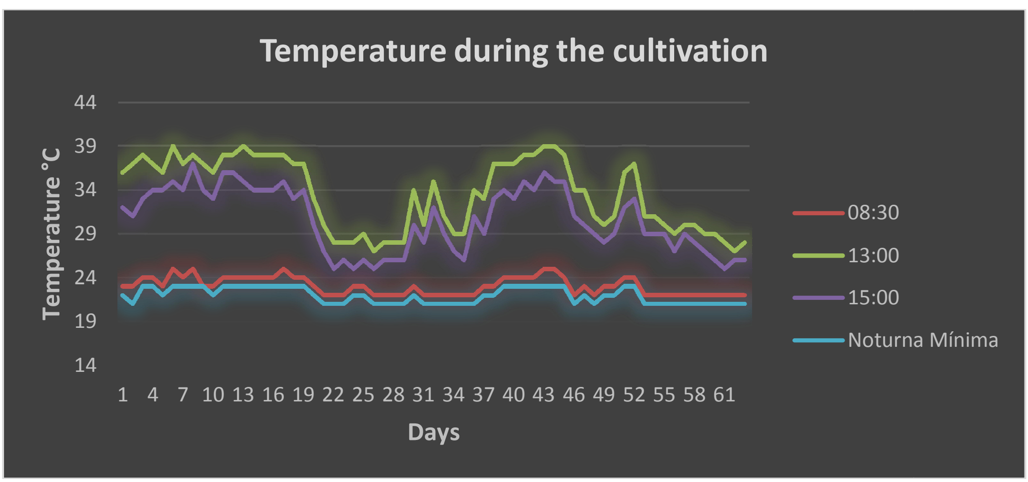

Fig. 1. Temperature during the 63 days of cultivation the 08:30 am, 01:00 pm, 03:00 pm and the low of the night period

Table 1. Minimum medium temperatures, maximum averages and general averages of the periods of accomplishment of the selection cycles

Temperature °C	CL1	CL2	CL3	CL4	CL5	CL6
Minimum	19,98	22,05	20,26	21,21	21,27	19,62
Maximum	26,31	28,016	26,04	27,15	27,37	26,45
Medium	32,64	33,98	31,82	33,09	33,48	33,27

Selection periods: 01/10/2012 to 01/12/2012 (CL1), 19/02/2013 to 19/04/2013 (CL2), 30/10/2013 to 30/12/2013 (CL3), 06/01/2014 to 06/03/2014 (CL4), 24/02/2016 to 24/04/2016 (CL5a) and 24/09/2016 to 25/11/2016 (CL5b)

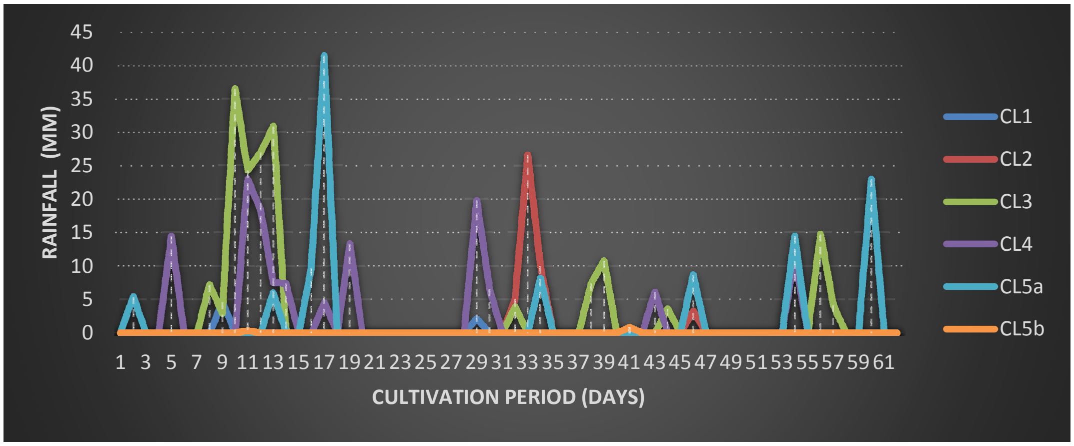

Fig. 2. Daily precipitation during the periods in that the selection cycles were accomplished

2.4 Data Analysis

The used statistical analyses were variance analysis in agreement with the number of each level of the factors, a test of Tukey to 5% of probability for the cycles inside of each evaluation time. For to MD the variance analysis took into account just the selection cycles as variation source. They were dear the earnings for selection. For the determination of the variables that you/they presented larger variation among the selection cycles, the technique multivariada of main components was used, in that they were used as criterion the discard of the characteristics that fewer contributed in the selection in the selection cycles through the largest elements of the autovetores associated ace characteristics, breaking of the last main components, considering the absolute value. Every statistical methodology was accomplished following the proposal of [13]. through the application Genes.

3. RESULTS AND DISCUSSION

In agreement with the test F to 1% of probability, there was the significant difference among the selection cycles for the variables Length of the main Stem (LMS) and Number of Leaves (NL) and to 5% of probability for the Number of Feminine Flowers (NFF). For the evaluation periods, there was a significant difference to 1% of probability for all the appraised variables. For the interaction cycle x period there was a significant difference 1% of probability for LMS and NL. To 5% of probability, there was a significant difference just NFF, the other variables didn't present significant difference for interaction (Table 2).

In agreement with the test of Tukey to 5% of probability can be ended that for the length of the primary (LMS) foliage to the 15, 23, 39, 55 and 63 days after the planting (DAP) that there was no significant difference among the selection cycles, with respective averages of 8.75; 32.22; 101.70; 165.08 and 189.78 cm. Just to the 31 and 47 days after the planting there was a significant difference among the cycles, tends the cycles of larger more advanced selection CRP (Table 3).

For the medium length of the secondary (LSS) foliage there was no significant difference in any evaluation period, with respective averages of 0.00; 4.81; 43.25; 66.95; 88.05; 115.05 and 126.86 cm.

The number of leaves (NL) was not also influenced by the selection, not presenting significant difference, with respective averages of 1.88; 10.00; 14.96; 18.83; 23.21; 31.75 and 40.95 leaves in agreement with DAP. However, among the cycles C1 and C5a there was an increase of 15.89% of the number of leaves, that is due mainly for the small ones won to each selection cycle.

The area to foliate (AF) to 15 DAP it presented an average of 39.42 cm², not having significant difference among the selection cycles. For the other evaluation periods the cycles C5a and C5b presented the largest AF in comparison with the other cycles, increasing the difference in agreement with the growth of the melon plant, with an average of 143.57; 383.58;445,45; 682.73; 730.83 and 884.22 cm², respectively for the 23, 31, 39, 47, 55 and 63 DAP.

Table 2. Analysis of variance of the vegetative and reproductive characteristics

Source of variation	DF	MS								
		LMS	LSS	NL	AF	NF	NMFB	NFFB	NFRUITS	DM
Blocks	3'3''*	188,99	17,94	4499,57	4,92	6,56	1,32	0,62	0,84	4,16
Cycles (C)	5'5''*	1198,47**	10,25 ns	23851,51**	12,57ns	0,65ns	10,54ns	2,12*	0,64ns	1,95ns
Residue 1	15'15''*	70,57	14,13	1007,64	8,40	6,58	4,42	0,66	0,36	2,19
Periods (P)	6'3''	110779,72**	60693,79**	1962752**	4169,19**	1149,91**	316,86**	24,51**	57,04**	-
C x P	30'15''	124,29**	0,90ns	2543,36**	4,96ns	4,28ns	3,54ns	0,98*	0,19ns	-
Residue 2	108'54''	24,20	4,38	565,70	3,39	3,71	2,13	0,46	0,45	-

*** - Significant to 1% of probability for the test F; * - Significant to 5% of probability for the test F. ns. No significant to 5% of probability for the test F. LMS- Length of the Main Stem; LSS- Length of the Secondary Stem; NL- Number of Leaves; AF- Area to Foliate; NF- Number of Floral Buttons; NMFB- Number of Masculine Floral Brotações; NFF. Number of Feminine Floral; NFRUITS. Number of Fruits*

Table 3. Averages of the vegetative characteristics of melon plant populations submitted the salinity

Cycle/Period	Length of the Primary Stem (LPS)						
	15	**23**	**31**	**39**	**47**	**55**	**63**
C1	8,07a	31,75a	70,25b	98,45a	133,47b	159,35a	176,00a
C2	8,00a	29,35a	77,25ab	97,57a	137,30b	158,67a	175,50a
C3	8,67a	31,97a	82,50ab	102,10a	145,87ab	160,30a	185,75a
C4	9,30a	32,15a	82,13ab	101,72a	143,82ab	166,52a	185,97a
C5a	9,22a	34,22a	92,00a	105,20a	161,52a	173,22a	209,25a
C5b	9,27a	33,92a	88,50ab	105,17a	163,30a	172,47a	206,25a
Average	8,75	32,22	-	101,70	-	165,08	189,78
Cycle/Period	**Medium length of the Secondary Stem (MSS)**						
	15	**23**	**31**	**39**	**47**	**55**	**63**
C1	0,00a	4,32a	41,97a	65,70a	86,07a	114,12a	126,15a
C2	0,00a	4,57a	42,32a	65,92a	88,02a	114,02a	126,80a
C3	0,00a	4,90a	43,60a	67,15a	88,37a	114,50a	126,85a
C4	0,00a	4,95a	43,77a	67,27a	88,42a	115,20a	126,87a
C5a	0,00a	5,00a	43,82a	67,72a	88,62a	116,25a	127,42a
C5b	0,00a	5,09a	44,02a	67,95a	88,82a	116,22a	127,02a
Average	0,00	4,81	43,25	66,95	88,05	115.05	126,86
Cycle/Period	**Number of Leaves (NL)**						
	15	**23**	**31**	**39**	**47**	**55**	**63**
C1	1,75a	9,50a	15,00a	18,00a	23,00a	33,25a	40,25a
C2	1,75a	10,25a	15,25a	18,75a	22,50a	29,75a	36,00a
C3	1,76a	9,75a	14,00a	18,75a	23,00a	30,75a	41,75a
C4	1,99a	10,25a	14,75a	19,25a	22,75a	31,50a	41,75a
C5[a]	2,01a	10,00a	15,25a	18,25a	23,50a	32,00a	43,75a
C5b	2,02a	10,25a	15,50a	20,00a	24,50a	33,25a	42,25a
Average	1,88	10,00	14,96	18,83	23,21	31,75	40,95
Cycle/Period	**Area to Foliate (AF)**						
	15	**23**	**31**	**39**	**47**	**55**	**63**
C1	34,25a	132,30ab	293,60d	413,92bc	562,30c	669,72c	743,02c
C2	33,77a	121,27b	328,32c	409,72c	581,00c	669,30c	730,90c
C3	36,87a	130,92ab	355,65b	431,27ab	615,00b	663,80c	774,47b
C4	39,20a	134,12ab	344,05bc	422,35bc	611,25b	697,57b	775,40b
C5a	38,82a	145,45a	391,02a	447,10a	686,52a	733,67a	891,85a
C5b	39,42a	141,70a	376,15a	443,80a	678,95a	728,00a	876,60a
Average	37,06	-	-	-	-	-	-

Following averages for the same letters in the column don't differ statistically amongst themselves for the test of Tukey to 5% of probability. C1- First Cycle of Selection; C2- Second Cycle of Selection; C3- Third Cycle of Selection; C4- Fourth Cycle of Selection; C5a- Fifth Cycle of Selection (São José da Tapera); C5b- Fifth Cycle of Selection (Água Branca)

According to Aragão et al. [7] and Medeiros et al. [9] all the vegetative and productive characteristics of the melon are reduced as the saline concentrations increase, in that way, the development of you cultivate tolerant the salinity should have an objective to do with that the plant even in half saline, maintain his/her growth the closest possible of the growth in conditions without salinization.

For the number of floral buttons (NFB), number of male flower buds (NMFB), number of feminine flowers (NFFB) and number of fruits (NFRUIT) among the selection cycles there was no significant difference to 5% of probability for the test of Turkey for none of the evaluation periods, with averages of 7.88; 17.06; 12.79 and 0.96 floral buttons, respectively to the 39, 47, 55 and 63 DAP (Table 4).

The NMFB presented respective averages in agreement with the period of evaluation of 3.68; 5.04; 9.92 and 9.37 masculine flowers. NFFB presented respective averages of 1.42; 2.25; 3.42 and 3.54 feminine flowers. NFRUIT presented an average of

0.00; 0.42; 2.71 and 3.00 fruits for the plant, respectively to the 39, 47, 55 and 63 DAP.

The reproductive characteristics are also influenced negatively by the salinity, according to [7] to a reduction in the number of flowers, in about 80%, in other words, for the development of tolerant plants the salinity, genotypes that you/they present larger numbers of flowers when submitted to the saline stress present a characteristic potentially of supporting the effect noxious of the salt in their structures. Usually the melon plant when submitted to the stress hydric, saline, high temperatures, among other, they tend her produce larger proportion of masculine flowers in comparison with feminine flowers, reducing the possibility to produce fruit [5].

Besides the reduction of the number of flowers, other damages caused by the excess of salt is the abortion of the flowers and fruits, as told by [3], fact that reduces the possibility of a high productivity considerably, due the reduced number of fruits for plant that you/they arrive to the final apprenticeship of maturation and consequent crop.

Table 4. Averages of the reproductive characteristics of melon plant populations submitted the salinity

Cycle/Period	**Number of Floral Buttons (NFB)**			
	39	**47**	**55**	**63**
C1	7,00a	16,25 a	15,25a	1,5a
C2	7,91a	15,75 a	14,00a	1,00a
C3	7,99a	17,00a	11,75a	0,75a
C4	8,08a	17,62 a	12,50a	0,75a
C5a	8,12a	17,75 a	11,75a	1,00a
C5b	8,16a	18,00a	11,50a	0,75a
Average	7,88	17,06	12,79	0,96
Cycle/Period	**Number of Masculine Floral buds (NMFB)**			
	39	**47**	**55**	**63**
C1	2,50a	4,75a	10,75a	8,00a
C2	2,25a	3,50a	9,25a	9,25a
C3	5,50a	5,25a	11,50a	8,75a
C4	3,00a	4,25a	8,75a	10,25a
C5a	3,85a	5,75a	9,00a	9,25a
C5b	5,00a	6,75a	10,25a	10,75a
Average	3,68	5,04	9,92	9,37
Cycle/Period	**Number of Feminine Floral buds (NFFB)**			
	39	**47**	**55**	**63**
C1	0,75b	2,50ab	3,50a	3,75a
C2	0,50b	1,25b	3,00a	3,50a
C3	1,75ab	2,25ab	3,00a	3,50a
C4	1,50ab	1,75ab	3,25a	4,00a
C5a	2,50a	3,25a	4,00a	3,00a
C5b	1,50ab	2,50ab	3,75a	3,50a
Average	1,42	2,25	3,42	3,54
Cycle/Period	**Number of Fruits for Plant (NFP)**			
	39	**47**	**55**	**63**
C1	0,00a	0,00a	2,25a	2,50a
C2	0,00a	0,50a	2,50a	2,75a
C3	0,00a	0,50a	2,50a	3,25a
C4	0,00a	0,50a	3,00a	3,50a
C5a	0,00a	0,50a	3,00a	3,00a
C5b	0,00a	0,50a	3,00a	3,25a
Average	0,00	0,42	2,71	3,04

Following averages for the same letters in the column don't differ statistically amongst themselves for the test of Turkey to 5% of probability. C1- First Cycle of Selection; C2- Second Cycle of Selection; C3- Third Cycle of Selection; C4- Fourth Cycle of Selection; C5a- Fifth Cycle of Selection (São José da Tapera); C5b- Fifth Cycle of Selection (Água Branca)

The selection cycles accomplished in the population melon plant PM1 promoted small reduction in the percentile of matter dries to each election cycle, not presenting significant difference among the cycles, confirmed by the test of Tukey to 5% of probability, with averages of 13,92; 13,10; 13.05; 12,62; 11,94 and 12,28%, respectively for the cycles C1, C2, C3, C4, C5a and C5b (Fig. 3). It is possible to observe that even with small influences of each selection, as the cycles move forward, the tenor of MD decreases, in other words, melon plant plants present a strategy of tolerance larger amount of water in the aerial part, to supply the shortage of available water due to the high cellular osmotic potential, necessary to dilute the saline concentration in the cytoplasm and to maintain the plant in development conditions [14].

The tolerance the salinity if to give for two main reasons, the individual tolerance of cells (intercellular spaces and the biochemical signalling) and the tolerance involving the control of the absorption and internal transport of salts and the accumulation of In the inside the plant. In that way, the tolerant plants absorb larger amounts of water suffer less the effects caused by the salts, time that gets to control inside through different strategies the levels of salt of the plant, increasing like this the capacity to resist to the poisonous effects and decrease of the water potential of their cells [15].

In the selection accomplished mass it was possible to verify that happened small won in each so much cycle for the characteristics vegetative as reproductive, due to the great number of genes involved with the tolerance the salinity. Exactly for that, the cases of success in the development of you cultivate of tolerant melon plant the salinity the ecotype selection is used, in that superior plants in way submitted mass are selected the salinity, promoting like this small won by cycle. The case of larger success is to cultivate BG 84-3 developed in Israel in 1990 [10].

The critical phase of exhibition of the melon plant the salinity is the growth and the flowering, already the product of the fruits is not influenced negatively in a large part of the cases, being in some beneficial cases for increasing the quality of thefruits due to the elevation of the solids [3].

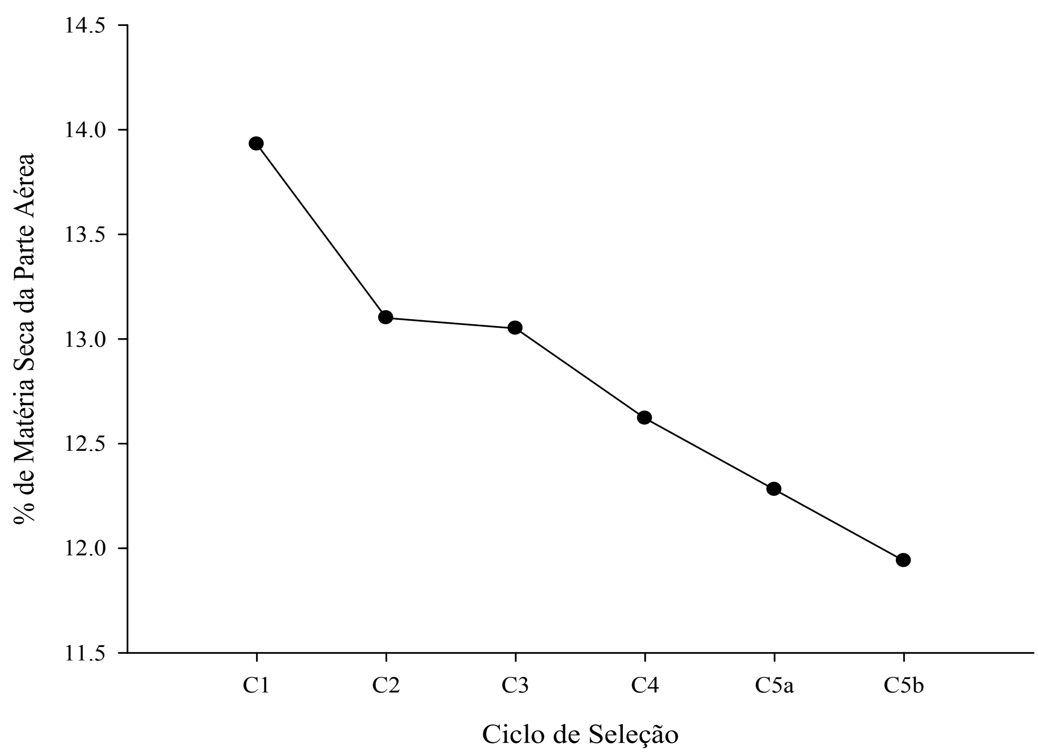

Fig. 3. Percentile of matter it dries of the aerial part of the cycles of a selection of melon plant populations submitted the salinity

During the growth phases and flowering, the melon plant needs the maximum of nutrients and water, so that the physiologic needs are supplied and it can reach like this the maximum of development, however it is exactly in that phase that the osmotic stress and the ionic toxicity cause larger effects, due to the accumulation of the salts everywhere of the plant, mainly in the leaves [16,17].

During the growth and the flowering of the melon plant it happens the pick of gaseous changes with the middle, with that the excess of salt decreases the readiness water of the plant to that change, causing a dehydration of the cells, reduction in the cellular divisions, alterations of the pH intracellular, among other effects, in that way, every development and growth of the vegetable is influenced [17,18].

The medium earnings of selection for LPS were of 5,82%, presenting variation from -0,28 to 12,52%, respectively between the selections of C1-C2 and C4-C5a (Table 5).

The medium earnings of selection presented averages of 5.82; 0.22; 2.28; 6.50; -10.00; 6.76; -0.14, 6.62 and -0.46% respectively for the characters LPS, MSS, NL, AF, NFB, NMFB, NFFB, NFRUIT and %MDAP. In the selection of a cycle for the another, there was variation in the earnings of the selection, presenting negative values besides in some cases, showing that the selection presents the great influence of the environmental conditions in the experimental field of the selection, mainly the precipitation and the temperature.

The heritability presented expressive values for LPS (94,11%), AF (95,77%), and NBFF (68,69%). According to Falconer [19] the heritability involves all the variance components and it represents the contribution of the genetic component in the value phenotypic. Observing the medium earnings of selection and the heritability of those characteristics, it is possible to end that in the selection seeking to obtain a tolerant population the salinity, the characteristics LPS, AF, NFFB are of easy genetic control, time that you/they presented high heritability values and won medium favourable.

The %MDAP is one of the characteristics of larger importance in the selection of tolerant genotypes the salinity, due to existent relationship with the swinging water of the plant, what alters the proportion of water in the plant, however that characteristic presented low heritability, showing that for accomplishment of the selection seeking the tolerance the salinity is made necessary the use of more complex improvement methods, besides influencing in other factors as increase of the number of plants in the selection [20], in that way it is necessary the support of tools as markers physiologic, biochemical and molecular to reduce the time in the selection.

Table 5. I win for selection and genetic parameters of the cycles of melon plant selection submitted the salinity

Cycle/Character	Win for selection (%)								
	LPS	**MSS**	**NL**	**AF**	**NFB**	**NMFB**	**NFFB**	**NFRUIT**	**%MDAP**
C1-C2	-0,28	0,52	-10,56	-1,63	-33,33	15,63	-6,67	10,00	-0,82
C2-C3	5,84	0,04	15,97	5,96	-25,00	-5,41	0,00	18,18	-0,55
C3-C4	0,12	0,02	0,00	0,12	0,00	17,14	14,29	7,69	-0,43
C4-C5A	12,52	0,43	4,79	15,02	33,33	-9,76	-25,00	-14,28	-0,33
C4-C5B	10,90	0,12	1,20	13,05	-25,00	16,22	16,67	18,18	-0,68
WMS (%)	5,82	0,22	2,28	6.50	-10,00	6,76	-0,14	6,62	-0,47
H^2 (%)	94,11	37,83	33,19	95,77	28,97	57,66	68,69	44,01	12,07
C.V.1 (%)	8,08	5,91	14,33	7,25	26,49	30,16	30,65	39,20	11,56
C.V. 2 (%)	4,74	3,29	9,11	5,43	19,91	20,87	25,58	44,27	-
$C.V._g$ (%)	6,11	6.77	1,91	6,52	33,11	8,81	11,36	8,70	10,92
CV_g/CV_e	1,33	0,87	7,51	1,11	0,80	3,42	2,69	4,50	0,94

C1- First Cycle of Selection; C2- Second Cycle of Selection; C3- Third Cycle of Selection; C4- Fourth Cycle of Selection; C5a- Fifth Cycle of Selection (São José da Tapera); C5b- Fifth Cycle of Selection (Água Branca); WMS- win Medium of Selection; LMS- Length of the Main Stem; LSS- Length of the Secondary Stem; NL- Number of Leaves; AF- Area to Foliate; NF- Number of Floral Buttons; NMFB- Number of Masculine Floral Buds; NFF. Number of Feminine Floral buds; NFRUITS. Number of Fruits; %MDAP- Percentile of Matter it Dries of the Aerial Part; H² - Heritability; C.V.1- Coefficient of Variation of the Portions; C.V.2- Coefficient of Variation of subplots; C.V.g- Genetic Coefficient of Variation; CVg / CVe- Relationship between the Coefficient of Genetic Variation and the Coefficient of environmental Variation

Table 6. An estimate of the corresponding eigenvalues (λj) the variation percentages explained by the main components and respective eigenvectors (eigenvectors coefficient)

MC	Eigenvectors		Eigenvectors								
	Λj	**λj (%)**	**LPS**	**MSS**	**NL**	**AF**	**NFB**	**NMFB**	**NFFB**	**NFRUIT**	**% MDAP**
Y1	6,2474	69,41	0,38	0,38	0,39	0,32	-0,20	0,28	0,30	0,30	-0,36
Y2	1,4401	85,41	0,11	-0,15	0,13	0,40	0,64	-0,08	0,45	-0,37	0,11
Y3	0,7994	94,29	-0,07	-0,15	-0,09	0,18	-0,31	0,74	0,08	-0,28	0,42
Y4	0,3656	98,36	-0,17	0,05	-0,24	0,43	0,40	0,19	-0,31	0,61	0,18
Y5	0,1474	99,99	-0,29	0,05	-0,33	-0,02	-0,23	-0,22	0,73	0,33	0,21
Y6	0,00006	99,99	0,02	0,43	-0,08	0,53	-0,32	-0,43	-0,22	-0,29	0,28
Y7	0,000001	99,99	0,11	0,68	0,03	-0,46	0,32	0,15	0,04	-0,04	0,41
Y8	0,00000	99,99	-0,74	0,09	0,65	0,03	0,01	0,01	-0,01	0,01	0,02
Y9	0,00007	100,00	-0,37	0,35	-0,46	0,06	0,11	0,22	0,03	-0,32	-0,58

MC. Main Components; Λj. Absolute Eigenvectors; λj (%). Eigenvectors in Percentage LMS- Length of the Main Stem; LSS- Length of the Secondary Stem; NL- Number of Leaves; AF- Area to Foliate; NF- Number of Floral Buttons; NMFB- Number of Masculine Floral Brotações; NFF. Number of Feminine Floral Buds; NFRUITS. Number of Fruits; %MDAP- Percentile of Matter it Dries of the Aerial Part

Table 7. Correlations of pearson

Characteristic	MSS	NL	AF	NFB	NMFB	NFFB	NFRUIT	% MDAP
LPS	0.92**	0,99**	0,82**	-0,38	0,64**	0,79**	0,64**	-0,95**
MSS		0,90**	0,69**	-0,58*	0,63**	0,62**	0,87**	-0,95**
NL			0,81**	-0,36ns	0,61**	0,80**	0,60**	-0,91**
AF				-0,02 ns	0,68**	0,84**	0,45 ns	-0,59**
NFB					-0,59*	-0,05 ns	-0,57*	0,46 ns
NMFB						0,49 ns	0,45 ns	-0,40 ns
NFFB							-0,57**	-0,59*
NFRUIT								0,78**

*** Significant to 1% of probability for the test of t; * - Significant to 5% of probability for the test t; ns. No significant to 5% of probability for the test t. LMS- Length of the Main Stem; LSS- Length of the Secondary Stem; NL- Number of Leaves; AF- Area to Foliate; NF- Number of Floral Buttons; NMFB- Number of Masculine Floral Buds; NFF. A number of Feminine Floral Buds; NFRUITS. Number of Fruits; %MDAP- Percentile of Matter it Dries of the Aerial Part*

The variation coefficients so much for portions, as for subplots they went low for the vegetative characteristics, indicating the smaller influence of the atmosphere for the same. For the reproductive characteristics, the variation coefficients were high, due to the influence of the atmosphere in the expression of those characteristics. The relationship CVg / CVe was close or superior to 1 for all the variables, according to Vencovsky [21], a very favorable situation exists for the obtaining of earnings in the selection when the relationship CVg / CVe, tends to a (1.0) or larger than 1.0 in the measure that the genetic variation overcomes the environmental variation, being like this, it is possible to affirm that the progress phenotypic observed in the study is due to the genetic effect, indicating that even before the characteristics of the plant that suffered a lot of influence of the atmosphere the genetic component is larger than the environmental.

The estimates of the eigenvalues λj corresponding to the first main components and the consideration (eigenvectors) coefficients are presented in Table 6. In agreement with the referring data the variables the first two components present estimates of superior eigenvalues to 1 (6.2474 and 1.4401, respectively), being in agreement with Falconer (1975) that established as criteria for selection of the main components with superior eigenvalues to 1, which explain 85.41% of the found total variation, that second [22] above 80% of the total variation it is already enough for retreat of conclusions above the studied variables, being then for the variables NL and NFB those that presented larger representativeness in the variation during the election cycles.

The NBF presented great variation in function of the atmosphere, being that characteristic influenced by several stresses like salinity, temperature, regime hídrico among other factors, then use her as a reference in the selection is a risk, besides, that characteristic didn't present high correlation with the others (Table 7). NL presented the largest importance in the vectors and it presented correlation with several characteristics, like LPS (0.99), MSS (0.90), NFFB (080) and %MDAP (0.91), in most vegetative variables, being like this, it is the best option for selection, time that the growth characteristics according to [7,8,9] they are the more used for determination of the level of tolerance the salinity in melon plant.

The high correlation of NL with the vegetative characteristics is due mainly for the fact of plants with larger load present more leaves, there is also larger amount of feminine flowers. Regarding the %MDAP the measure that the number of leaves increases, reduces the proportion of dry matter, exactly what was observed during the selection, in that the most advanced cycles presented smaller %MDAP, confirming the use of the number of leaves in the selection as the main characteristic to be observed.

4. CONCLUSION

The selection cycles presented genetic progress as the tolerance the salinity. The number of leaves is the characteristic to be selected for obtaining of tolerant superior genotypes the salinity.

COMPETING INTERESTS

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

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