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Recurrent Selection and Selfing with Selection as a Tools for Improvement of Sweet melon (*Cucumis melo* var. *aegyptiacus*)

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THE PRESENT investigation was carried out during three successive summer seasons of 2012, 2013 & 2014, in order to study the efficiency of one cycle of simple recurrent selection and selfing with selection for two generations as two breeding methods on some important characters of sweet melon. Coefficient of variation (C.V%) for the characters, main stem length, leaves number/plant, branches number/plant, fruit weight, fruit polar diameter, fruit equatorial diameter, fruit number plant^{-1}, fruit flesh thickness, and total soluble solids, were estimated. In a relatively large population of cultivar "Kahera-6" of sweet melon reflected, generally, enough variability for the purposes of selection and improvement. Generally, the results indicated that all the studied characters were improved through the two practiced breeding methods, simple recurrent selection and selfing with selection, but with different magnitudes among the characters and the used breeding methods. Variability magnitudes within the studied characters were declined as a result of practicing the two breeding systems, but with more severe reduction in the second selfed progenies, relative to the simple recurrent selection population. The estimated values of the correlation coefficients among the various pairs of the studied characters illustrated generally that twenty two out of the possible thirty six relationships appeared to be significant and desirable for the objectives of selection in the present study.

Keywords: Sweet melon, Recurrent selection, Selfing with selection, Coefficient of variation and Correlation.

Sweet melon (*Cucumis melo* var. *aegyptiacus* L., 2n=2x=24) is one of the important vegetable crops belonging to family *Cucurbitaceae*. Fruits are consumed in the summer period and are popular because the pulp of the fruit is very refreshing, high nutritional and sweet with a pleasant aroma (Melo *et al.*, 2000). In Egypt, it is noticed that a large number of local sweet melon genotypes are cultivated and some farmers grow sweet melon for local consumption using uncertified seeds from unknown sources. Sweet melon shows a great variability which determines horticultural market class designations that include differences in mature fruit in shape, sweetness, color, exocarp characteristics, diameter and weight (Silberstein *et al*., 2003 and Monforte *et al*., 2005). Despite the large diversity that has been observed among melon germplasm, no serious attempts have been made to purify and upgrade the productivity and acceptability of this crop (Neitzke *et al*., 2009). In Egypt most of the cultivation of sweet melon is based on local open pollinated cultivars which are maintained by farmers, and produced for self-consumption and sold on local markets. So, developing local sweet melon, based on local genotypes, may result in very promising outputs, especially because the germplasm of sweet melon available in Egypt has a high genetic variability (El-Shimi and Ghoneim, 2006).

Understanding the magnitude of variability among sweet melon genotypes for traits of economic importance it is, therefore very necessary to plan effective breeding programs. Since, the wide range of variability available opens immense scope to design the identification of superior genotypes. Accordingly, it is important to plan effective breeding programs for sweet melon improvement such as selection procedure, which leading to the identification of superior genotypes. Thus selection for desirable traits on such highly variable characters would be effective improvement program in sweet melon, as in other open-pollinated crop,. Recurrent selection is one of the efficient selection's methods that is usually used for improving open-pollinated crops. This method maintains genetic variability, and consequently, the natural vigor of cross pollinated crops, while, at the same time, allowing the concentration of desirable alleles and increasing the frequency of superior recombination in successive populations. Several investigators indicated the effectiveness of recurrent selection in increasing genetic improvement by raising the gene frequencies of the desirable alleles for various economical characters of cucurbits such as, Mitiady *et al.* (2005), Cardoso (2007), Hazara *et al*., (2007), Gwanana *et al.* (2008) on pumpkin. Generally, such researchers illustrated that the studied characters of the different cucurbits plants can be improved by using recurrent selection method.

Inbreeding is the mating of closely related individuals in a population. Successive inbreeding increases the homozygosity by bringing together identical alleles at a locus which is usually associated with inbreeding depression on vigor and other characters, in cross-pollinated crops, but with various degrees. However, in many cases, inbreeding with selection increases the effectiveness of selection and the amount of genetic improvement in a breeding program by increasing the frequency of the desirable alleles. Some investigators studied the effect of inbreeding and/ or selfing with selection on some important characters of cucurbits such as Cardoso (2004) on squash, Godoy *et al.* (2005) on cucumber and Hazara *et al.* (2007) on pumpkin.

Concerning the magnitude of variability among melons and some other cucurbits genotypes for some economic and important traits, several investigators estimated the phonotypic and/or genotypic variability coefficients such as Tomar *et al*. (2008), Ibrahim, (2012), Ibrahim and Ramadan (2013), on melon, Kumar *et al*., (2013) on cucumber, and Husna *et al*. (2014) on bottle gourd. Their results illustrated generally that estimates of variability among genotypes for the different studied characters appeared to be high, with a wide range, which reflected the high potential for effective selection in breeding programs to improve the characteristics of this crop.

Correlation coefficient analysis provides information about the association between any two traits and the partitioning of relationship into direct and indirect effects showing the relative importance of each of the causal factors. Thus, studies on correlation enable the breeders to know the mutual relationship between various characters and determine the component characters on which selection can be used for genetic improvement. In this respect, phenotypic correlation coefficients between some pairs of melons characters, i.e., vegetative, yield and its components, were estimated by many workers such as, Taha *et al*. (2003), Zalapa *et al*. (2006)., Feyzian *et al*. (2009) and Naroui Rad *et al*. (2010). The main objective of this study was to estimate and compare the efficiency of one cycle of simple recurrent selection method with that of selfing with selection for two generations as two breeding methods, on the improvement of some economic traits of sweet melon. The phenotypic correlation coefficients among the various studied traits were, also, estimated to assist sweet melon's breeders in their selection programs.

Materials and Methods

This study was carried out during the summer seasons of 2012, 2013 & 2014, at the Experimental Station Farm of the Faculty of Agriculture, Alexandria University, Abies, Alex., A.R.E.as follows:

Original genetic material

The genetic material used in this investigation was the common commercial "Kahera-6" cultivar, sincea lot of variation and deterioration was observed and reported by many farmers and researchers. Seeds of the "Kahera-6" cultivar were sown on April 15, 2012. The experimental area included 130 ridges, 4.5m long and 2.80m wide, and the spacing between hills within ridges was 90cm. The cultural practices such as fertilization, irrigation and pests control were performed as usually recommended for sweet melon's commercial production whenever they appeared necessary.

Data Recorded and Variability Estimations

The studied characters, that were measured on the basis of individual plants, include: main stem length (cm), leaves number/plant, branch number/plant, fruit weight (kg), fruit polar diameter (cm), fruit equatorial diameter (cm), fruit number/plant, fruit flesh thickness (cm), and total soluble solids content (T.S.S.%). After harvesting of mature fruits, samples from each fruit were randomly bulked and samples of flesh were juiced to determine total soluble solids content (T.S.S. %), using a digital refractometer. The recorded data were used to calculate the statistical variability parameters: ranges, means and coefficients of variations (C.V. %) for each character.

Initial Selection and Production of the First Selfed Generation

At the beginning of flowering stage, the best 75 plants from the growing population (about 950 plants) were primarily selected on the basis of the general performances of their visual vegetative growth characteristics, i.e., main stem length, leaves number/plant and branches number/plant, The selection criteria used in the primary selection were based on the following desirable characters, long stems, more leaves/plant, and a more branches/ plant. Then, each of the selected plants was selfed by hand pollination, using pollen grains, which collected from mature anthers of just opened flowers that were bagged before by a paper bag. After the completion of the hand pollination (that was always done on the early morning) the pollinated flowers were, also, bagged till fruit setting. At the fruit matured, a second and more severe selection, according to the following desirable fruit's characters, a heavy fruit's weight, a longer polar diameter, a wider equatorial diameter, a thicker flesh thicken and high total soluble solids, was done. Then, the seeds of each selected plants were separately extracted, dried and stored to use in the next generation. The number of the second selected plants came out to be only 35.

Seed Production of the First Cycle of Recurrent Selection (C_1) and of the Second Selfed Progenies (S_2's)

Seeds of the first selfed progenies (S_1's) were separately sown on April 10, 2013. Selection, on the same foregoing basis, was practiced within – and between the selected progenies of the first selfed selection plants to maintain the most five promising progenies of the next cycle of self-pollination. At flowering stage, some of the developing floral buds were selfed to produce the seeds of the second selfed progenies (S_2's), whereas, all other flowers were left for open-pollination to produce the seeds of the first cycle (C_1) of the simple recurrent selection.

Evaluation of the Derived Populations (C_1) and (S_2's) with Original population (C_0)

Seeds of the original population (Co) and that of the first recurrent selection cycle population (C_1), as well as those of the second selfed progenies (S_2's) of the five selected populations were sown on April 17, 2014. In this experiment a randomized complete blocks design (R.C.B.D), with three replicates was used. Each plot consisted of three ridges, 5m long and 2.8m wide, and the plants were allowed to grow at 90 cm spacing. All recommended cultural practices for commercial sweet melon production were followed.

Statistical Analysis

The statistical analyses of all the recorded data of the previously mentioned characters were conducted by the standard method of the randomized complete blocks design as illustrated by Al-Rawi and Khalf-Allah (1980), using Co-State Software (2004), computer program for statistics. The least significant difference test (L.S.D) was used to test the significance of the differences between means. The phenotypic correlation coefficients between the different pairs of all studied characters were also estimated as illustrated by Mather and Jinks (1971). Also, the statistical parameters of variability, *i.e.*, ranges and coefficients of variation (C.V. %) for each studied characters were calculated.

Results and Discussion

Table 1 show the results of the estimated values for the statistical parameters means, ranges and coefficients of variation (C.V.%), for all studied characters of the original population (Co) of the sweet melon "Kahera-6" cultivar. The results of the estimated values of coefficient of variation, clearly, indicated that the original population (Co) was characterized with a high variability, which ranged from 26.16% for fruit polar diameter up to 45.36% for fruit weight. The results showed also that the range values for each character in the original population were found to be wide. Such results seemed to be due to that this cultivar is old enough and has been commercially grown for a long period without any purification and improvement. Moreover, the highest detected extreme values noticed in the results showed a wide range for most of the studied characters, which reached more than double of the population mean in particular characters, clearly, suggesting a high potential for improving such characters in sweet melon. This large variation as demonstrated for most of the investigated characters of the original population supported the high possibilities of conducting successful and efficient selection to introduce new cultivar, with better general performances than their original population. Such an opinion is agreed completely with ideas of El-Shimi and Ghoneim, (2006) and Ibrahim, (2012), who found that local cultivars of sweet melon are considered as a rich source of variation and can be used as a main selection material in breeding programs to improve the characteristics of this crop. Also, Kumar *et al*., (2013) found wide ranges of variation in most this crop. Also, Kumar *et al*., (2013) found wide ranges of variation in most of the studied characters in cucumber, and they concluded that their studied characters could be improved through selection.

TABLE 1. Mean ($\bar{X}$), ranges and coefficients of variation (C.V. %) for all studied characters of the original population of "Kahera-6" cultivar of sweet melon in 2013 season.

Parameters / Characters	$\bar{X}$	Range	C.V %
Main stem length (m)	3.70	1.70 – 7.20	40.00
No. of leaves plant^{-1}	140.60	70.00 – 220.00	35.42
No. of branches plant^{-1}	4.40	2.00 – 6.00	38.60
Fruit weight (kg)	2.65	0.85 – 4.20	45.36
Fruit polar diameter (cm)	17.16	10.32 – 25.30	26.16
Fruit equatorial diameter (cm)	25.60	12.25 – 35.30	30.72
Fruits number plant^{-1} (kg)	2.71	1.51 – 5.20	30.00
Fruit flesh thickness (cm)	2.75	1.50 – 5.00	30.26
Total soluble solids (T.S.S %)	4.69	2.96 – 8.00	28.66

Accordingly, it was expected that all studied characters could be improved through selection, using a recurrent selection method, but, with varying degrees, depending on the amount of variation present in the population and heritability of the concerned characters.

The results for the comparisons among the different statistical parameters, means, ranges and coefficients of variations, of the different studied characters of the seven different populations, original population (Co), population derived from the first cycle of recurrent selection (C_1) and second selfed progenies of the five individual selection [S_2-1, S_2-2, S_2-3, S_2-4, and S_2-5] are lasted in Tables 2, 3 and 4.

Respecting the vegetative growth characters, main stem length, leaves number /plant and branches number/plant, the comparisons among the means of the seven different populations (Table 2) indicated generally that all selected populations were characterized with long main stems, more numbers of leaves and number of branches /plant, than those of the original population (Co). The differences among the mean values of each studied character for all selected populations appeared to be significant, but with different magnitudes, compared to those of the original population**.** The results showed also that the coefficients of variations (C.V. %) values and ranges of the derived population were found to be lower and narrower, relative to those of the (Co). These results indicated, clearly, that the practiced recurrent selection cycle was able to increase, significantly, the characters main stem length, leaves number/plant and branches number/plant from 3.83m, 145.60 and

TABLE 2. Means ($\overline{x}$), ranges and coefficients of variations (C.V %) for main stem length (cm) leaves number plant^{-1}, and branches number plant^{-1} for the different populations.

Characters / Parameters	Main stem length (m)			Leaves number / plant			Branches number/ plant		
Populations	$\overline{X}$	**Range**	**C.V %**	$\overline{X}$	**Range**	**C.V %**	$\overline{X}$	**Range**	**C.V %**
C_o	3.83 e	2.00-6.00	38.20	145.60 d	64.20-235.00	36.31	4.20 e	2.00-6.00	40.72
C_1	4.32 cd	2.50-5.00	28.30	175.75 c	89.60-210.00	21.52	4.70 de	3.00-6.00	25.11
S_2-1	5.00 ab	3.33-5.89	18.50	199.33 ab	110.00-200.00	19.11	4.88 cd	3.00-5.00	18.07
S_2-2	4.03 de	3.20-5.30	22.00	195.64 ab	100.00-198.00	20.3	5.07 c	3.00-6.00	22.12
S_2-3	4.05 de	3.10-5.00	21.60	200.00 ab	110.00-208.00	15.08	5.51 b	4.00-6.00	17.38
S_2-4	5.26 a	3.87-6.00	19.65	204.39 a	115.00-210.00	17.33	5.74 a	4.00-6.00	21.60
S_2-5	4.73 bc	3.00-5.50	25.83	185.63 bc	106.00-200.00	20.60	4.9 c	3.00-6.00	21.50

Values having similar alphabetical letter(s) do not significantly differ, using Duncan's multiples range test (L.S.R.) at 0.05 level of probability.
Co= Original population C_1= Population of the first recurrent selection cycle
S_2 (1)-S_2 (5) =Progenies of the second selfed generation of five individual plant selections.

4.20in the original population (Co) up to 4.32 m, 175.75 and 4.70 in the population of the first recurrent selection cycle, respectively. These results reflect desirable increments in the mean values of the three characters, main stem length, leaves number/plant and branches numbers/ plant which estimated by 12.79%, 20.70% and 11.90%, respectively. These results seemed to agree with the findings of Gwanama and Nichterlein (2005) on vine length, numbers of branches and leaves per plant, and Maheswari and Haribabu (2005) on vine length and number of branches per plant, who found significant differences among genotypes of pumpkin.

In the case of the progenies of selfing with selection, the increments in the characters main stem length, leaves number/plant and branches number/plant were noticed to be within the range of 12.27% - 37.85%, 27.49% - 40.37%, and 16.19% - 36.66% for the three characters, respectively. These results might be expected, since these characters seemed to be simply inherited. So, the successful selection for long stems, more leaves and branches could be related to gene action involved in the inheritance of these characters, that seemed to be additive, as reported by Maheswari and Haribabu, (2005) on pumpkin. Also, Zalapa, *et al*., (2006) found that additive gene effect was greater than dominance in the inheritance of lateral branches number of melon.

The results illustrated also that the first recurrent selection cycle (C_1) reduced the (C.V.) values from 38.20% in (Co) to 28.30% in (C_1) for main stem length, from 36.31% in Co to 21.52% in (C_1) for leaves number/plant, and from 40.72% in (Co) to 25.11% in (C_1) for branches number/plant. Whereas, in the second selfed progenies, S_2-1, S_2-2, S_2-3, S_2-4, and S_2-5, the reductions were greater, and the estimated (C.V) values were found to be in the range from 18.50% to 25.83% from main stem length, from 15.08% to 20.60% for the leaves number/plant and from 17.38% up to 22.12% for the number of branches/plant. Such improvements attained in these characters, through the two selection methods, indicated that both methods were efficient in concentrating the genes of long main stem, higher numbers of leaves and branches/plant.

Pertaining fruit characteristics of sweet melon, *i.e.*, fruit weight, fruit polar – and equatorial diameters, Table 3 illustrated that using one cycle of recurrent selection reflected significant increases in the mean values of the population C_1, compared to the original population (Co) for these characters. Similarly, Zalapa, *et al*. (2006) on melon fruit weight, and Wehner and Cramer (1996) on fruit weight, fruit diameter and fruit length, found that recurrent selection method has been used to improve these characters in cucumber.

The estimated values of the ranges and coefficients of variations (C.V%) reflected also lower variability magnitudes after the first cycle of recurrent selection.

Since, the (C.V %) values in the original population were 43.12% for fruit weight, 26.50% for fruit polar diameter, and 31.00% for fruit equatorial diameter, and they were reduced by 30.25%, 19.41% and 22.41% for the three fruit characters, respectively, after the first recurrent selection cycle.

TABLE 3. Means ($\overline{x}$), ranges and coefficients of variations (C.V %) for fruit polar diameter (cm) fruit equatorial diameter (cm), and fruit weight (kg) for the different populations.

Characters / Parameters	Fruit polar diameter (cm)			Fruit equatorial diameter (cm)			Fruit weight (kg)		
Populations	$\overline{X}$	Range	C.V %	$\overline{X}$	Range	C.V %	$\overline{X}$	Range	C.V %
C_o	16.20 d	9.20-25.50	26.50	24.16 d	12.00-36.34	31.00	2.30 d	0.76-4.50	43.12
C_1	20.45 b	13.00-23.50	19.41	28.59 c	20.00-32.40	22.41	3.00 c	1.30-4.25	30.25
S_2-1	22.93 a	15.00-24.60	20.11	31.31 a	18.00-31.90	21.61	3.90 a	3.00-4.20	22.18
S_2-2	18.94 c	14.00-22.00	21.30	25.55 d	20.00-29.60	17.81	3.50 b	2.30-4.00	25.15
S_2-3	21.25 b	16.00-23.00	15.25	29.41 bc	23.00-31.50	19.17	3.20 bc	2.00-3.50	26.05
S_2-4	21.60 b	17.00-24.00	16.60	30.56 ab	22.00-32.00	18.08	4.00 a	3.10-4.20	24.34
S_2-5	20.56 b	15.20-21.90	20.32	28.37 c	18.00-30.00	21.61	3.00 c	2.10-3.80	24.23

Values having similar alphabetical letter(s) do not significantly differ, using Duncan's multiples range test (L.S.R.) at 0.05 level of probability.
Co= Original population C_1= Population of the first recurrent selection cycle
S_2 (1)-S_2 (5) =Progenies of the second selfed generation of five individual plant selections.

Reducing effects on variability, in the case of selfing with selection, appeared to be more pronounced, since the (C.V%) values of all selfed progenies were severely, reduced to reach the range from 22.18% to 26.05% for fruit weight, from 15.25% to 21.30% for fruit polar diameter, and from 18.08% to 21.61% for fruit equatorial diameter, in the (Co) and the (C_1), respectively. Such achieved improvements may be related to relatively high amounts of variability in the original population. Also, selfing with selection resulted in concentrating the desirable genes of these characters, which cooperated in realizing the obtained results. In this respect, the successful selection for fruit weight character could be related to gene action involved in the inheritance of this character that was found to be mostly additive, as illustrated by Hazara (2007).

With reference to the characters fruits number/ plant, fruit flesh thickness and total soluble solids, the results concerning these characters in Table 4 reflected, generally, improvements in these three characters after only one cycle of recurrent selection as well as the selfing with selection for two successive generations. The comparisons among the mean values of these three characters illustrated generally that the means values of the characters fruits number/plant, fruit thickness and total soluble solids were significantly increased to 17.39%, 14.50% and 36.66%, respectively, after one cycle of recurrent selection (C_1), over the original population (Co). Selfing with selection, also, increased these three characters in their progenies with about 30.43% to 95.65% for fruits number plant^{-1}, 14.50% to 87.02% for fruit flesh thicknesses and 6.00% to 20.00% for total soluble solids content, relative to the original population means. The results indicated also that the great variability magnitudes in the original population offered good opportunities to improve these characters. Also, the successful selection for improving of the two characters total soluble solids and flesh thickness of sweet melon could be related to the type of action involved in the inheritance of these characters, which were found by Mohanty (2000) on fruit flesh thickness, and Gwanama *et al* (2008) on total soluble solids content, who found that both additive and non-additive gene effects were important in the inheritance of these two characters .They reported also that these two characters could generally, indicated that the variability estimates would be improved by recurrent selection. The ranges and coefficients of variation values, reduced, with different magnitudes in all derived populations, compared with the original population as appears in Table 4. These results reflected the efficiency of the two selection methods to improve these characters. Similar results were obtained by Marek *et al.* (2008) on soluble solids, who reported that the different genotypes of pumpkin varied in their contents of these two characters, and some of them appeared to have superior and favorable values for soluble solids contents.

TABLE 4. **Means ($\bar{x}$), ranges and coefficients of variations (C.V %) for fruit number plant^{-1},flesh thickness (cm), and T.S.S.% for the different populations.**

Characters / Parameters	Fruit number plant^{-1}			Flesh thickness (cm)			T.S.S.%		
Populations	$\bar{X}$	**Range**	**C.V %**	$\bar{X}$	**Range**	**C.V %**	$\bar{X}$	**Range**	**C.V %**
C_o	2.30 d	1.30-6.00	32.32	2.62 f	1.30-5.20	31.71	4.50 e	3.00-9.50	30.00
C_1	2.70 cd	2.00-6.00	23.41	3.00 e	2.50-5.00	24.60	6.15 d	4.10-9.00	21.21
S_2-1	4.10 a	3.12-5.10	19.61	4.00 c	3.60-5.00	16.70	9.00 a	7.50-9.20	18.00
S_2-2	3.30 b	2.20-4.00	20.40	3.60 d	2.91-4.00	21.21	8.90 a	7.90-9.00	16.73
S_2-3	3.00 bc	2.00-4.30	20.00	3.00 e	2.67-3.44	18.22	8.50 b	7.30-8.90	18.40
S_2-4	4.50 a	3.41-5.00	15.32	4.90 a	3.21-5.01	18.40	9.00 a	7.50-9.00	15.43
S_2-5	3.20 b	2.00-4.45	22.50	4.40 b	3.50-5.00	22.30	7.20 c	5.20-7.50	19.12

Values having similar alphabetical letter(s) do not significantly differ, using Duncan's multiples range test (L.S.R.) at 0.05 level of probability.
Co= Original population C_1= Population of the first recurrent selection cycle
S_2 (1)-S_2 (5) =Progenies of the second selfed generation of five individual plant selections.

With respect to phenotypic correlation coefficients, the estimated correlation coefficients among all possible pairs of the studied characters, in Table 5, illustrated that twenty two out of the possible thirty six relationships appeared to be desirable for the objective of the present study, and highly correlated, since their estimated correlation coefficients were found to be either significant or, even, highly significant. On the other side, the other values of correlation coefficients (14 relationships) were insignificant. Desirable positive and significant correlations were detected between main stem length with each of leaves number/plant and branches number/plant. Leaves number/plant appeared to be positively correlated with each of branch number/plant, fruit weight, fruit polar diameter, fruit equatorial diameter, fruits number/plant, flesh thickness and T.S.S.% . These results indicated that selection for more leaves/plant (a desirable form) would lead spontaneously, for the improvement of the previously seven characters. Branches number/plant showed positive correlation with each of fruit weight, fruit equatorial diameter, fruits number/plant, fruit flesh thickness and T.S.S. These desirable relationships suggested, clearly, that selection for more branches number/plant would subsequently resulted in increasing the fruit weight, fruit equatorial diameter, fruit flesh thickness, and total soluble solids. Fruit weight was found to be correlated with each of fruit equatorial diameter, fruit polar diameter, fruits number/plant (with negative sign), fruit flesh thickness, and T.S.S. The estimated relationship between fruit weight and fruit equatorial diameter agreed with that reported by Taha *et al.* (2003), Iathet and Piluek, (2006) on melon. Also, positive correlation between fruit weight with fruit flesh thickness was in accordance with those obtained by Naroui Rad *et al.* (2010) and Ibrahim and Ramadan, (2013) on melon. The results of correlation coefficients indicated, also, that there were positive relationships between fruit polar diameter and fruit equatorial diameter, and total soluble solids and each of fruits number/plant and fruit flesh thickness. These results seemed to agree with that reported by Naroui Rad *et al.* (2010), who reported positive and significant correlation between fruit polar diameter and fruit equatorial diameter.

TABLE 5. Phenotypic correlation coefficients among the studied characters of sweet melon " Kahera-6" cultivar.

characters	Leaves No.plant^{-1}	Branches No. plant^{-1}	Fruit weight (kg)	Fruit polar diameter (cm)	Fruit equatorial diameter (cm)	Fruits No. plant^{-1}	Fruit flesh thickness (cm)	Total soluble solids (T.S.S.%)
Main stem length (cm)	0.582*	0.627**	0.355	0.222	0.395	0.344	0.175	0.444
Leaves No. plant^{-1}		0.764**	0.724**	0.716**	0.625*	0.709**	0.586*	0.868**
Branches No. plant^{-1}			0.803**	-0.213	0.835**	0.819**	0.623**	0.75**
Fruit weight (kg)				0.823**	0.813**	-0.643**	0.726**	0.746**
Fruit polar diameter (cm)					0.754**	0.478	0.418	0.431
Fruit equatorial diameter (cm) Fruit equatorial diameter (E, cm)						0.380	0.341 0.750**	0.445 0.723**
Fruits No. plant^{-1}							0.421	0.671**
Fruit flesh thickness (cm)								0.849**

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الانتخاب المتكرر والانتخاب مع التلقيح الذاتى كأدوات لتحسين الشمام

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تم تنفيذ البحث خلال ثلاث مواسم صيفية فى الفترة من ٢٠١٢ حتى ٢٠١٤، وذلك بهدف دراسة كفاءة دورة واحدة من الانتخاب المتكرر وكذلك دورتين من التلقيح الذاتى كطريقتين من طرق التربية لتحسين بعض الصفات الهامة فى محصول الشمام. حيث تم تقدير الاختلافات عن طريق حساب معامل الاختلافات لصفات طول الساق الرئيسية، عدد الأوراق للنبات، عدد الأفرع للنبات، متوسط وزن الثمرة، القطر الطولى الثمرة، القطر العرضى الثمرة، عدد الثمار للنبات، سمك اللحم والمواد الصلبة الذائبة الكلية للحم. حيث عكست هذه الصفات وجود درجة كافية من الاختلافات والتى تسمح بالانتخاب والتحسين لهذا المحصول (صنف قاهرة ٦). كذلك أوضحت النتائج أن استخدام كلا طريقتى الانتخاب سواء الانتخاب المتكرر أو التلقيح الذاتى لمدة جيلين، قد عملت على تحسين الصفات المدروسة ولكن بدرجات متفاوتة وذلك حسب الصفة المدروسة وبرنامج الانتخاب المستخدم. أما بالنسبة لدراسة معامل الارتباط بين أزواج الصفات فقد عكست النتائج وجود علاقات ارتباطيه بين عدد من الصفات المدروسة معنوية ومرغوبة والتى يمكن الاستفادة منها فى برامج التربية بالانتخاب.