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Genetic improvement of traits in Khatooni melon using mass selection in Iran

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Abstract

High genetic diversity of Melon (Cucumismelo L.) in Iran and cross pollination of this product over the last years has led to serious genetic erosion.In order to improve average desirable traits of Iranian Khatooni melon, a field experiment conducted in Mashhad and Torbate-jam based on two selection periods. Studied traits included yield, earliness, fruit weight, the number of fruit, flesh and skin diameter, sugar content, fruit length and width, flesh and skin weight, and seed weight. Fruit yield in modified genotype increased 11.92% and 33.49% respectively after one and two period selection compared to primary genotype. Also fruit weight increased 24.3% in modified genotype after two period selection compared to primary genotype. In the present study, modified Khatooni cultivar compared with two other genotypes included primary Khatooni and imported Khatooni melon with Argon brand in two locations of Mashhad and Torbate-jam. Results showed that there was no significant difference between Mashhad and Torbate-jam in terms of yield. Fruit yield of melon in Torbate-jam (29.35 ton.ha^{-1})was greater than Mashhad (26.69 ton.ha^{-1}) consequence of higher average fruit weight of melon in Torbate-gam.

Key words : Breeding, Yield component, Sugar content, fruit Quality, Melon

INTRODUCTION

Melon (*Cucumismelo* L.) belong to *Cucarbitaceae* family, it is a commercial vegetable crop, grown in different regions of Jordan. The total area cultivated to this crop was estimated at 1010 ha in 2002 with annual yield production of 36,500 million tons. Melon (*Cucumismelo* L.) is an important crop from an economic perspective [1]. Melon fruits have wide morphological, physiological and biochemical diversity. This high level of phenotypic variability corresponds to a high-genetic variability [2]. Iran is one among the centers of origin of melons and therefore. There is a wealth of genetic variation of this species in the country [3]. Iran ranks third in melon production after China and Turkey. More than 85,000 ha are under the cultivation of melons in Iran [4].

The largest producer of cantaloupes and other melons worldwide in 2004 was China, accounting for over 50 percent of world production by weight, followed by Turkey with 6.1 percent, Iran was third with 4.4 percent, the U.S. fourth with 4.2 percent, and Spain fifth with 3.9 percent [4].

Edible melons are divided into six botanical groups including *Flexuosus* (snake melon; Middle East), *Conomon* (Asia), *Cantalupensis* (Middle East), *Inodorus* (Middle East, Southern Europe), *Chito* (mango melon; Asia) *Dudaim* (Queen's pocket melon; Asia), and *Momordica* (Phoot or snap melon; Asia). Several of these groups are economically important in developed countries based on their culinary attributes. These include Group *Cantalupensis* (e.g., “Earl's”, “House”, “Galia”, “Charentais”, and “Ogen” market types), Group *Inodorus* (e.g., “Honeydew” and “Casaba” market types) and Group *Conomon* (e.g., “Oriental” market types) which differ markedly in fruit characteristics such as netting, shape, interior texture, flavor, aroma, and shelf life to form specific commercial market classes[5].

In Iran, the *Cantaloupensis* and *Inodorus* groups are most important for commercial production. The cultivation of these crops in dry regions and desert fringes like Varamin, Garmsar, and Khorasan has a better qualitative and quantitative production. The number of fruits on each plant, average fruit weight, main stem length, number of nodes on main stem and internode length were correlated positively with yield, and these factors can be recommended as criteria for selection [6]. Several local open-pollinated cultivars that are commercially grown in different regions are available in Iran. A highly promising open-field cultivar 'Khatooni' that contains very high soluble solids content of 14-15% or higher is widely cultivated in Iran [7].

Genetic improvement has played a vital role in enhancing the yield potential of vegetable crops. There are numerous vegetable crops grown worldwide and variable degrees of research on genetics, breeding and biotechnology have been conducted on these crops [8]. Most cucurbit fruits produce a lot of seeds that very useful for genetic studies. Cucurbit seeds are variable in size, shape and structure traits which are used in family classification [9]. Haploidy has been of interest for theoretical genetic and plant breeding analyses, but has not been used to date for improvement in melon. Inheritance and dominance relationships of economically important plant and fruit character of melon are not as simple as their quantitative descriptions and gene symbols imply. Yield is a quantitative trait, meaning that it cannot have a discrete value, as in the case of red vs. white flowers. Quantitative traits must be measured, rather than classified, and often have many genes controlling them, and a large amount of environmental variation. Loci controlling quantitative traits are called quantitative trait loci (QTL). [10] screened a diverse set of watermelon cultivars for fruit yield. They observed wide variation for yield in watermelon. These cultivars can be used to develop high yielding populations and measure the narrow-sense heritability.

Short-range objective is almost exclusively focused on combining uniformly high quality with one or more disease resistances. Mild-range goal includes shifting to monoecious or gynoecious type for F_1 hybrid seed production, insect resistance, air pollution and salt tolerance, novel fruit types to broaden utilization of melons, and novel plant types for home gardeners or concentrated fruit-set for onceover harvest. Long-rage goal includes development of biotechnological tools for interspecific hybridization (including transformation) for introduction of specific genes into the melon genome. The diversity of fruit types complicates and slows the progress of melon breeding program [8]. Mass selection is frequently used for genetically improving

Selection is considered an integral part of applied breeding programs and changes genetic composition of population. The amount of these changes depends on genetic diversity and selection intensity. Selection principles are different based on plant species and propagation methods. Cross-pollinating and self-pollinating plants have different selection methods. Selection leads to improvement of traits in cross and self-pollinating crops [11].

In mass selection a large number of superior appearing plants are selected and harvested in bulk and the seed used to produce the next generation. Mass selection has proved to be very effective in improving qualitative characters, and, applied over many generations, it is also capable of improving quantitative characters, including yield, despite the low heritability of such characters. Mass selection has long been a major method of breeding cross-pollinated species, especially in the economically less important species [12].

High yield and uniform fruit shape, size and excellent quality are prerequisites for the release of superior melon varieties. Yield is correlated with several traits including days to anthesis, primary branch number, fruit number and weigh per plant and average weight per fruit [13].

[1] Investigated impact of different irrigation levels on the melon fruit characteristics. There was a high correlation between each fruit characteristic and irrigation levels. The total melon fruit yield varied from a growing period to another in the same season. The number of fruits on each plant, fruit weight, Length and diameter of melon, number of nodes on the main stem and internode length have positive correlation with the yield and these factors can be recommended as selection criteria for genetic improvement.

Average yield of rapeseed is very low compared to its genetic potential. To increase the yield, study of direct and indirect effects of yield components provides the basis for its successful breeding programmed and hence the problem of yield increase can be more effectively tackled on the basis of performance of yield components and selection for closely related characters [14].

[15] In a study on thirteen variable lines representing different melon types reported that there are a positive and significant associations between the earliness and plant length, number of primary branches, number of secondary branches and fruit weight and there are a negative and significant associations between the earliness and total soluble solids.Investigation and correlation between plant traits is an important step to improve crop yield that can reduce the period of plant breeding program through selection methods.

Local populations of Iranian Melon have low uniformity and yield. In order to improve some traits of Khatooni melon related to yield and yield components this study was carried out.

MATERIAL AND METHODS

To improve genotype traits of Khatooni melon, this study was carried out at Agricultural Research Station of Mashhad (Iran), using mass selection method.For this purpose, field divided into 20 networks using Gardner method. Each Gardner network was 21×15 in measurement and each plot contains 5 rows of 21 meters that 100 plants were grown in it.At the first year, after fruit ripening 10% of desired fruits were selected from each plot. Desired fruits were selected based on maturity, marketability, growth quality and health of plants and fruits. The seeds from selected plants are bulked for the next generation separately. Selected seeds were numbered and half of the selected seeds were maintained in store and half of them were sown in the next year. In the second year, each of the selected numbers were planted in a row of 15 meters and traits of them were assessed. After selecting the best plants and fruits in the second year, the seeds of plants that have been chosen were mixed with others were kept in the store. For the third year,the seeds have been obtained from the second year, were planted with the same method of Gardner network and selection was done according to the first year. At least 10% of the desired fruits and seeds selection was done separately. In the fourth year, the seeds of the third year were planted in a row of 15 meters based on their numbers and selected seeds were mixed together according to the first year.

In the third year (after the first selection) and fifth years (after the second selection) primary genotypes were compared with modified genotype.

To study the agronomic traits, considered fruit characteristics and improved seed varieties, an experiment was conducted in 2012 in Mashhad and Torbat-e Jam (Iran). This experiment was done in two locations, in randomized complete block design with three replications and three Khatooni melon genotypes including modified, primary and imported (Argon) khatooni melons were compared together. Each plot consisted of four rows in 10 meters with row spacing of 3 meters and plant spacing of 70cm. Ripe fruits were harvested from two rows of each plot in the middle after removing two meters from the beginning and end of each plot. Fruits were counted and weighted and transferred to the laboratory to measure yield, earliness, fruit weight, the number of fruit, flesh and skin diameter, sugar content, fruit length and width, flesh and skin weight, seed weight and germination percentage of seeds. Cavity diameter and length and width of the melon fruits were measured with a ruler and sugar content of fruits were recorded using refractometer. The seeds of each fruit weighted after drying, and percentage of germination was obtained in germinator during a week.

RESULT

Yield and its components

Yield can increase with increasing the number of fruits per plants or fruits weight, or both of them. In this breeding program, the number of fruits per plants and fruits weight increased that caused increasing mass yield. Fruit weight is an important component of yield that has high correlation with yield. Fruits weight increased in masses with different ratio. The number of fruits is an important components of yield that has a high correlation with it. This trait increased well during selection.

Fruit yield in modified genotypes increased 11.92% and

Table 1: Agronomic traits of Khatooni genotype of melon after one and two period selection

Traits	After one period selection			After two periods selection		
	Primary genotype	Modified genotype	Traitimprovement percentage	Primary genotype	Modified genotype	Trait improvement percentage
Yield (ton.ha-1)	24.75	27.70	11.92	23.56	31.45	33.49
The number of fruit per plant	2.10	2.60	23.81	1.20	3.10	47.62
Fruit weight (kg)	3.80	4.10	7.89	3.70	4.60	24.32
The number of branches per plant	4	4	0	4.20	4.20	0
Plant length (cm)	176.25	177.66	0.80	183.32	185.46	1.17
Fruit length (cm)	39.45	41.25	4.56	38.25	44.40	16.08
Fruit width	18.31	19.50	6.50	18.25	21.20	16.16

Table 2: Seed and fruit traits of Khatooni genotype of melon after one and two period selection

Traits	After one period selection			After two periods selection		
	Primary genotype	Modified genotype	Traitimprovement percentage	Primary genotype	Modified genotype	Trait improvement percentage
Flesh diameter (cm)	3	3.20	6.67	3.10	3.4	9.68
Flesh weight (kg)	2.40	2.65	10.42	2.45	2.95	20.41
Skin diameter (cm)	0.47	0.45	-4.26	0.48	0.41	-14.85
Skin weight (kg)	1.40	1.38	-1.43	1.45	1.35	-10.34
Inner cavity (cm)	7.70	7.60	-1.30	7.70	7.50	-2.60
Seed weight in fruit (gr)	211.51	231.28	9.59	210.2	249.85	18.86
1000 seed weight (gr)	61.18	65.54	7.13	61.35	68.45	11.57
Percentage of fruit sugar	11.50	12.20	6.09	11.50	13	13.04
Percentage of seed germination	87.65	92.25	5.25	87.23	98.45	12.86

33.49% after one and two selection periods respectively compared to primary genotype (Table 1). In modified genotypes the trait of fruit weight increased 24.3% after two selection periods compared to primary genotype (Table 1). Fruit size is an important characteristic that affect market preference.Increasing the average fruit weight of melon increases total fruit yield and farmers can get higher profit and that means higher yields and higher profits. Melon produce a lot of flowers but some of them become fruit. The high and low number of fruits are not desirable. Both high and low number of fruit compared to optimum numbers of fruit may reduce yield. In pure melons using mass selection method, the number of fruits per plant increased 47.62% compared to primary melons (Table 1).

Fruit length and width:

Two of the key traits that were selected during breeding program were fruit shape and size. Melon fruit size is determined by measuring its length and width. In this experiment, after two selection periods of primary genotype, fruit length and width of Khatooni melon increased (Table 1).

Weight of flesh and skin:

Weight of flesh and skin in melon fruits, are important components of economic yield. Weight of flesh is an important quality factor in melon that has high and positive correlation with yield and yield components. Fruit weight increases with increasing weight of flesh, skin and seeds of melon. In breeding

Table 3: Analysis of variance for agronomic traits of modified Khatooni genotype in two locations

		Mean Squares						
Source of Variation	Degree of freedom	Yield	The number of fruits	Fruit weight	The number of branches	Plant length	Fruit length	Fruit width
Location	1	31.76^{**}	0.06^{ns}	0.11^{ns}	0.58^{ns}	0.14^{ns}	12.10^{**}	3.53^{ns}
Block×Location	4	0.84	0.02	0.005	0.035	0.025	2.80	1.14
Genotype	2	71.41^{**}	1.74^{**}	0.21^{*}	2.63^{ns}	0.35^{*}	5.53^{**}	1.92^{ns}
Genotype×Location	2	5.91^{**}	0.16^{ns}	0.003^{ns}	0.001^{ns}	0.019^{ns}	0.03^{ns}	1.59^{ns}
Experiment error	8	0.99	0.06	0.03	0..041	0.54	0.36	1.36
Coefficient of variation		3.56	7.54	6.60	5.37	4.19	1.43	5.47

Table 4: Analysis of variance for seed and fruit traits of Khatooni genotype in two locations

Source of Variation	Degree of freedom	Germination percentage	Sugar percentage	Flesh diameter	Flesh weight	Skin diameter	Skin weight	Cavity	Seed weight in fruit	1000 seed weight
Location	1	49.6^{ns}	0.09^{ns}	0.03^{ns}	0.17^{ns}	0.0008^{ns}	0.003^{ns}	98.85^{ns}	76.02^{ns}	7.89^{ns}
Block×Location	4	48.63	0.1	0.002	0.085	0.0006	0.007	82.63	42.44	0.664
Genotype	2	112.12^{ns}	0.76^{**}	0.12^{**}	0.32^{*}	0.01^{**}	0.04^{**}	98.15^{ns}	1717.29^{**}	44.76^{**}
Genotype×Location	2	49.70	0.007^{ns}	0.006^{ns}	0.037^{ns}	0.0002^{ns}	0.007^{ns}	125.25^{ns}	20.82^{ns}	0.18^{ns}
Experiment error	8	48.99	0.43	0.007	0.053	0.0003	0.003	150.45	16.70	1.64
Coefficient of variation		7.33	1.61	2.64	5.28	3.82	3.81	8.25	2.79	1.96

program, the main goal is increasing fruit flesh with minimum skin and seeds. Flesh weight of melon fruit increased 20.41% in modified genotype compared to primary genotype, but weight of skin decreased 10.34% in modified genotype. In this breeding program, flesh diameter increased 9.68% and diameter of skin decreased 14.58% (Table 2). High diameter of flesh in melon and low diameter of skin in this fruit are important quality factors which related to market preference.

Sugar content:

Sweetness is one of the most important quality factors in many fruits and Sugar content is of primary importance in determining the quality of melon fruit [16]. Genotypes of Iranian melon has acceptable sugar percentage. In this breeding program, the percentage of sugar increased 13.4% in Khatooni melons (Table 2).

The number and weight of seeds:

The number of seeds in modified fruits increased 18.86% after two period selection compared to primary genotype. Production of seedless melon with high fruit weight is one of the main goal in breeding program, but increasing fruit weight without increasing seeds weight is almost impossible. Melon breeding program has been directed toward obtaining plants with high fruit weight. It seems that for increasing fruit weight in breeding program, the ratio of flesh to skin and seeds should have a greater percentage of fruit weight. The high rate of seeds in melon fruits is suitable for the purposes of seed production. Large seed size is a good trait for both grain yield and seed production. Thousand seeds weight of modified fruits improved 11.57% compared to primary genotypes (Table 2).

Germination percentage:

Seeds obtained from modified genotypes after each selection, had better germination compared to primary genotype. Germination percentage of seeds increased 12.86% after two selections period compared to primary genotype (Table 2). Larger fruits produced larger seeds with higher viability.

Earliness and uniform ripening:

In this breeding program by selection method, fruit-ripening time reduced to 10 days. Fruit earliness is an important factor after yield. Fruit earliness with no yield loss, is an ideal goal for plant breeders. Increasing earliness for reduction of growing season and earlier supply of product to the market is an important matter in terms of economic. Early fruit commands high prices and earliness reduces growing costs because of the shorter cropping time. In this experiment, selection caused uniform ripening [8].

One of the breeding program goals is improving fruit quality of melon. Melon quality can be divided into four groups, including yield, appearance, flesh, and storability. Breeding

Table 5: Mean for agronomic traits of Khatooni genotype in two locations

	Yield ($ton.ha^{-1}$)	The number of fruit per plant	Fruit weight (kg)	The number of branches per plant	Plant length (cm)	Fruit length (cm)	Fruit width (cm)
Location							
Mashhad	26.69b	3.02a	2.66b	4.1a	178.17b	41.02b	20.88a
Torbate-jam	29.35a	3.13a	2.81a	4.1a	189.25a	42.66a	21.76a
Genotype							
Modified	30.29a	3.17b	2.93a	4.2a	188.18a	42.52a	21.95a
Primary	24.05c	2.50c	2.55b	4.1a	179.36b	42.74b	21.15a
Argon	27.71b	3.57a	2.63b	4a	181.45b	42.27a	20.96a

Table 6: Mean for seed and fruit traits of Khatooni genotype in two locations

	Flesh diameter (cm)	Flesh weight (kg)	Skin diameter (cm)	Skin weight (kg)	Cavity (cm)	Seed weight (g)	1000 seed weight (g)	Sugar (%)	Germination (%)
Location									
Mashhad	3.12a	1.6a	0.44a	1.40a	7.6a	230.70a	64.48b	1.80a	94.74a
Torbate-jam	3.20a	1.8a	0.45a	1.43a	8a	234.46a	65.80a	1.94a	96.07a
Genotype									
Modified	3.33a	1.9a	0.42b	1.37b	8.1a	247.99a	68.24a	1.13a	98.07a
Primary	3.05b	1.6b	0.49a	1.51a	8.03a	214.42c	63.07b	1.47b	90.43b
Argon	3.11b	1.7b	0.42b	1.37b	7.3a	234.83b	64.12b	1.02a	97.15a

Table 7: The interaction effect of location and genotype on agronomic traits of Khatoonimelon

Location	Genotype	Yield ($ton.ha^{-1}$)	The number of fruit per plant	Fruit weight (kg)	The number of branches per plant	Plant length (cm)	Fruit length (cm)	Fruit width (cm)
Mashhad	Modified	28.34c	3.13d	2.87b	4.1a	183.25b	41.67c	21.67ab
Mashhad	Primary	23.87f	2.47f	2.48f	4.2a	180.32c	40f	20.13c
Mashhad	Argon	27.86d	3.47b	2.63d	4a	180.42c	41.40e	20.88bc
Torbate-jam	Modified	32.24a	3.2c	2.98a	4.2a	190.12a	43.37a	22.24a
Torbate-jam	Primary	24.23e	2.53e	2.64e	4.1a	182.17bc	41.49d	22.17a
Torbate-jam	Argon	30.57b	3.67a	2.83c	4.1a	183.78b	43.13b	20.88bc

programs are complicated because each market niche demand different combination of these qualities[17]. Concentration yield quality refers to the duration of the harvest period. A major limiting factor in modern melon production system is the long harvest period. Concentrated yield for mechanical, ones-over harvest is an important goal. Inheritance of yield quality characters such as earliness and concentrated yield are complicated.

DISCUSSION

In this experiment, modified Khatooni cultivar was compared with two primary genotypes and imported Khatooni cultivar was compared with Argon brand in Mashhad and Torbate-jam. Results showed that location had significant effect on yield and fruit length ($p \leq 0.01$). Melon genotypes had significant effect on some traits including fruit yield, the number of fruit per plant, fruit length ($p \leq 0.01$) and fruit weight ($p \leq 0.05$) (Table 3). The effect of location on fruit quality traits was insignificant, but genotypes had significant difference in terms of flesh and skin diameter, skin weight, seed weight in fruit, thousand seeds weight, sugar percentage ($p \leq 0.01$) and flesh weight ($p \leq 0.05$).

Table 8: The interaction effect of location and genotype on seed and fruit traits of Khatooni melon

Location	Genotype	Flesh diameter (cm)	Flesh weight (kg)	Skin diameter (cm)	Skin weight (kg)	Cavity (cm)	Seed weight per plant (g)	1000 seed weight (g)	Sugar (%)	Germination (%)
Mashhad	Modified	3.27b	1.8b	0.42b	1.35c	8.2a	245.6b	67.43b	13.03c	98.07a
Mashhad	Primary	3.03e	1.5c	0.49a	1.48b	8.07a	214.4e	62.60f	12.43f	85.43b
Mashhad	Argon	3.07d	1.6c	0.42b	1.37d	7.97a	231.1d	63.40e	12.93d	97.90a
Torbate-jam	Modified	3.38a	2a	0.42b	1.38c	7.73a	250.4a	69.06a	13.23a	98.08a
Torbate-jam	Primary	3.07d	1.6c	0.48a	1.53a	8a	214.5e	63.54d	12.50e	98.06a
Torbate-jam	Argon	3.15c	1.7bc	0.42b	3.37d	7.9a	238.6c	64.83c	13.10b	97.74a

Table 9: The correlation coefficients amongagronomic, seed, and fruit traits of modifiedKhatooni melon

	Yield	Fruit weight	The number of fruit	Fruit length	Fruit width	Flesh diameter	Flesh weight	Skin diameter	Skin weight	Cavity	Seed weight per fruit**	1000 seed weight	Fruit sugar (%)	Germination (%)
Yield	1													
Fruit weight	0.985*	1												
The number of fruit	0.997**	- 0.995**	1											
Fruit length	0.999**	- 0.991**	0.999**	1										
Fruit width	0.907	- 0.996**	0.936	0.923	1									
Flesh diameter	0.904	-0.962*	0.934	0.921	0.998**	1								
Flesh weight	0.997**	- 0.995**	0.998**	0.998**	0.936	0.934	1							
Skin diameter	-0.997**	0.994**	-0.985*	-0.998**	-0.936	-0.934	-0.998**	1						
Skin weight	-0.996**	0.995**	-0.985*	0.998**	-0.936	-0.934	-0.997**	0.999**	1					
Cavity	-0.995**	0.995**	-0.978*	-0.998**	-0.936	-0.934	-0.998**	0.998**	0.998**	1				
Seed weight per fruit**	0.997**	0.995**	-0.986*	-0.997**	-0.936	-0.934	-0.998**	0.998**	0.998**	0.998**	1			
1000 seed weight	0.926	0.977*	0.953*	0.941	0.999**	0.997**	0.953*	-0.953*	-0.953*	-0.953*	-0.952*	1		
Fruit sugar (%)	0.652	-0.763	0.707	0.683	0.897	0.897	0.707	-0.707	-0.707	-0.707	-0.707	0.878	1	
Germination (%)	0.232	-0.058	0.157	0.192	-0.198	-0.198	0.157	-0.157	-0.157	-0.157	-0.159	-0.149	-0.531	1

Two locations of Mashhad and Torbate-jam had significant difference in terms of yield. Yield of fruit melonin Torbate-jam (29.35 $ton.ha^{-1}$) was greater compared to Mashhad location (26.69 $ton.ha^{-1}$) because of higher fruit weight in Torbate-jam. Torbate-jam is one of the most important area for melon cultivation in Iran and is more adaptable to melon cultivation compared to Mashhad.

As it has been shown in (table 4), length of melon plant and fruit in Torbate-jam are greater than Mashhad. Optimum climate conditions in Torbate-jam, caused higher plant growth and leaf area, resulted increasing production in this place.

Due to higher growth of vegetative organs and food production by leaves, average fruit weight and length increased. Fruit yield increased with increasing fruit length and weight, because of higher growth of vegetative organs and nutrition production by leaves. In this experiment, in terms of fruit quality traits, no significant differences were observed in two locations (Table 6).

The genotypes studied, showed significant differences for yield and its components. Modified Khatooni genotype had higher yield in two locations compared to primary genotype. Imported Argon genotype had higher yield than primary genotype, while it showed lower yield compared to modified genotype. Results showed that the number of fruit and fruit weight were higher in modified genotype compared to primary ones (Table 5 and 7). Modified genotype showed better performance in terms of flesh weight and diameter, seed weight per fruit, thousand seed weight, sugar content, germination percentage of seeds compared to two others genotypes (Table 6 and 8). Selection during two periods improved yield and some quality traits, as even modified genotype showed better performance than imported Argon melon.

In the present investigation, the highest fruit yield (32.24

ton.ha^{-1}) was obtained from Khatooni genotype in Torbate-gam. The highest average fruit weight, plant length and fruit length were 2.98 kg, 190.12 cm and 43.37 cm respectively.

Correlation between different melon traits has been shown in (table 9). In this study, fruit length had high positive correlation with yield, average fruit weight, and the number of fruit per plant. Also flesh weight of fruit showed high positive correlation with yield, average fruit weight and fruit length. According to [18],yield had high correlation with the number of fruit per plant and average fruit weight, so these characteristics could be useful as criteria for the selection. Also earliness had positive correlation with plant length, the number of primary branches, and fruit weight, while it had negative significant correlation with soluble solid contend of fruit and netted skin.

In another investigation, Mc Creith et al reported that some traits including earliness, fruit size, flesh thickness, soluble solid content, seed size and the number of fruit per plant have additive effects, so it seems that these traits can be improvedthrough selection method with progeny testing.

In an experiment on melon, [15] reported positive correlation of fruit yield with the number of fruit, average fruit weight, the number of leaves on main stem, internodes length and fruit shape.

[6] Evaluated variation of different Iranian melon cultivars (Cucumismelo L.). The results showed that there was a wide diversity in melon cultivars. Correlation analysis between traits showed a significant positive relation between fruit length with sugar content and positive relation between fruit weight with fruit length, fruit diameter, flesh thickness, skin thickness, and sugar content. A negative relation that was observed was between fruit length with fruit diameter, flesh thickness and skin thickness. Significant negative relation was observed between fruit length and seed cavity width.

CONCLUSION

Selection method in different periods can improve qualitative and quantitative traits in melon. Many researchers showed that selective populations from Iranian melon had better performance in terms of some traits compared to primary genotype [18,6]. As Khatooni melon is one of the most important cultivated and adapted melons to weather conditions of Iran, this modified population can be developed and planted in different regions of this country.

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