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STUDY THE GENETIC BEHAVIOR FOR SOME GENOTYPES OF MUSKMELON

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Abstract:

The genetic parameters regarding seven muskmelons (melon) genotypes—Meloky, Alqoshy, Walaty, Se-jeqal, Mostaqbal, Pineapple, and Hales best Jumbo—were studied in vegetable field of the Dept. of Horticulture and Landscape Engineering, College of Agriculture and Forestry, Univ. of Mosul throughout the spring of 2021 agricultural season. The study's most significant findings were summed up, and in the case when examining the sources of variation that genotypes differed, these results were analyzed. Significant differences were observed between them in the majority of traits examined at the probability 5% level for Duncan's polynomial test. Cultivar 7 outperformed the other genotypes in the trait of having more fruits in the plant, while genotype 2 outperformed the other genotypes in the traits of having the largest total yield per unit area (Dunum) and a weight of 100 seeds. Additionally, the proportion of heritability in the broadest sense has been high for all examined traits, exceeding 50%, and the phenotypic and genetic variation has been high for the traits of the weight of the fruit and seeds for each fruit, herb length, and the total seed output per unit area. The majority of variables under study showed favorable phenotypic and genetic correlations with the overall fruit yield per unit area.

Keywords: genotypes, muskmelon, heritability ratio, total fruit yield, seed yield, genetic and phenotypic correlation.

INTRODUCTION

Cucumis melo L., the scientific name for muskmelon plant, is specified as a member of Cucurbitaceae family and has 2N=24 chromosomes. It is regarded as one of the nation's basic summer veggies. Iraq is regarded as one of the agricultural nations that is eager to grow it on a daily basis and consume its fresh fruits. Muskmelon varieties vary in size, shape, taste, flesh, and skin color. Furthermore, no wild muskmelon plant was discovered; however, it is thought to have originated in India and was previously known to exist in China to the east and southern Europe to the west. Additionally, there is evidence that the explorer Christopher Columbus brought the plant's seeds to the New World (America) in the 15th century. From there, melon farming extended to South and North America (Matlob et al., 1989). Historical research also suggests that melon cultivation dates back to Iran and Egypt, about 2000 and 3,000 years BC, respectively. China and Spain are regarded as two of the most significant secondary centres of genetic variation. Research has shown that the ancient world, particularly Iran and India, is where muskmelon originated and is one of the centres of its genetic diversity (Hasan, 2001). Two chromosomal groups are used for cross-pollination (Paris et al. 2008). With 0.7 g of protein, 91.2 g of moisture, 7.50 g of carbohydrates, 0.1 g of fat, 14mg of calcium, 0.3 g of fiber, 0.4 mg of water per 100 g of edible amount, 16 mg of phosphorus, muskmelon has a good nutritional value for human consumption. Iron, 30mg folic acid, 0.3mg biotin, 12 mg sodium, 33 mg ascorbic acid, 0.04 mg thiamine, and 3400 IU of vitamin A (Hassan, 2001). The fruits of this plant include seeds that are rich in important fatty acids: palmate (38–45%), lauric (16–32%), streat (10–15%), and oleic (12–20%) (Jamshed et al., 1996).

Numerous productive factors, such as cultivating good varieties which are good for environmental conditions in plant's production area, as well as numerous environmental factors (weather as well as terrestrial) and agricultural service factors—such as fertilizers required for completing plant life cycle from seed to harvest and marketing—affect the productivity and growth of melon plants. One way to increase productivity and produce high-quality, consumer-acceptable fruits is to use modern agricultural methods, which include selecting good varieties which are good for conditions regarding the production region. Using contemporary agricultural methods, such as selecting good varieties that are suitable for conditions of the producing region, is one approach to boost productivity and produce fruits in a way that is pleasing to consumers. A lot of the vegetative and productive traits that distinguish different muskmelon varieties and genotypes are reflected in the nature of flowering, vegetative, and fruiting growth; these traits include variations in fruit size, color, shape, diameter, length, thickness, and flesh color, as well as variations in the number of carotenoids, sugars, and total soluble solids as well as in the color, shape, and number of seeds within a single fruit (Hassan, 2001). Shoemaker (2002) noted that in the case when evaluating multiple melon varieties, there were differences between cultivars in terms of average fruit weight, total yield of fruits, and number of fruits in each plant. Additionally, the cultivar Start Sweet outperformed other cultivars in terms of number of fruits/plants, and the cultivar RML8726 outperformed the others in terms of average fruit weight. Elizabeth *et al.* (2003) conducted a study to evaluate 7 melon cultivars, namely RML37-ACX60 - ACX70-1016SVR 1461 - RML38-RML39 –Vienna, showed that there are differences between genotypes and that cultivar ACX70 gave the highest number of marketable fruits in comparison with other cultivars, while the Vienna cultivar produced the maximum average fruit weight compared to the other cultivars. A study by Water *et al*. (2004) at the University of Saskatchewan recorded that when they evaluated some muskmelon varieties, the cultivar Athena was superior to the cultivar Earlligold in the traits of vegetative growth of plants, represented by the plant's dry weight, the leaf area and the percentage of roots, as well as in characteristics of the yield, which are represented by the total yield, the marketing yield and the weight of the fruit. In a comprehensive study that was carried out by Wilfred *etal*. (2005) at the University of North Carolina in America to evaluate a group of melon varieties (western, eastern, hazel, and other varieties) in which nineteen varieties were used Expedition, Desert Queen, Desert princess, Desert Desert prince, king) Sxm7208 Super45, Navigator, Magellan, Impac Hy-Mark, Voyager, Xme0059, PrimoMotagua, Riorico - Ugx-30-Durango, Ugx1302 to conclude that the proportion of soluble solids varies significantly; the Impac variety yielded the lowest percentage of soluble solids (8.9), whereas the Voyager type performed best with an 8.3 %. They also deduced that the number of fruits in each plant varied among the genotypes. It was noted that cultivar Sxm7208 produced the most fruits per acre.

When Dhalwal & Lal (1996) examined a few of the genetic factors of the most relevant economic characteristics, they found that total soluble solids, fruit weight, and meat thickness for an experimental unit differed significantly. According to Lal and Singh (2005), there was a large coefficient of phenotypic and genetic variation in melon plants for both vine length (herb) and total sugars. According to Zalapa et al. (2006), there are differences in the genotypes of muskmelon with regard to fruit shape, size, and quality as well as total yield. In research carried out by Carcia *et al*. (2009) on the evaluation of four muskmelon hybrids with some vegetative growth traits, the cultivar raucano outperformed the genotypes Packstar, 642 Hybrid, in the length of the main stem, while no significant differences appeared between the genotypes in the length of the branches. Research carried out by (2010) in Iraq studied the growth and productivity of two genotypes of muskmelon, that the cultivar Ideal is superior to the cultivar Pineapple significantly in characteristics of plant height, total leaf area of the plant, and dry weight. For the vegetative total, the cultivar Pineapple has been significantly better than the cultivar Ideal in terms of the percentage of total chlorophyll in leaves, the date of emergence of the first flower is considered early, and in the characterization of the number of fruits per plant, the yield of one plant, and the total yield per unit area, and the cultivar Ideal was significantly superior in each of fruit firmness, total soluble solids. Glala *et al.* (2011) indicated that the genotypes of 27 genotypes in muskmelon plants differed significantly among themselves in the number of lateral branches, the length of main stem, and the average weight trait. And early yield for each plant. Fruit, total soluble solids, and thickness of the flesh.

According to Arvind et al. (2018), there are statistically significant variations among melon plants with respect to plant height, the number of lateral branches on the main stem, number of fruits, and peel thickness. Additionally, Janghil et al. (2018) demonstrated that the results of variance analysis had indicated that there were significant differences between genotypes of melon with regard to the traits of vegetative growth and yield, in addition to the highest percentage of inheritance in general with regard to some traits of fruit yield and vegetative growth.

For the majority of the qualities under study, several researchers (Taha *etal*. 2003; Sundaram et al. 2011; Naroui Rad *etal*. 2010) found that in melon plants, the coefficient of phenotypic variance has been higher when compared to the coefficient of genetic variation. In muskmelon plants, phenotypic and genotypic variations, as well as general heritability, were found to be high for number of fruits per plant, fruit width, acidity, and yield per plant, yet low for fruit length (Singh and Tarseem, 1997; Boujghagh et al., 1999). Gurav et al. (2000) found a significant general coalition effect for the fruit length, fruit yield, number of fruits per plant, and average fruit weight, as well as a special significant coalition effect for melon yield characteristics of total yield, number of fruits per plant, and fruit length.

According to Lal and Singh (2005), vine length (grass), plant height, and total sugars in melon plants had a high coefficient of phenotypic and genetic variation (Zalapa, 2005; and Zalapa et al. 2008) derived from the estimate of some genetic characteristics in muskmelon that determine the overall yield's characteristic It can be inherited through heredity. Pornsuriya (2009) and Pornsuriya and Pileuk (2005) demonstrated that the dominant genes played a significant impact in the inheritance of the two melon traits, the fruit's diameter and length. According to Zalapa et al. (2006), there are genetic differences in muskmelon with respect to overall yield, fruit size, quality, and shape. Research of genetic variation in melon generations (P1, P2, F1s, F2s, BC1P1, BC1P2) revealed that the inheritance of two traits—the total yield—is significantly influenced by the dominance effect of genes. After evaluating fifty different melon genotypes, Rukam et al. (2008) discovered that there have been genotype differences in each trait that was studied. Those traits included length of the plant, total soluble solids' percentage, number of fruits in each plant, and number of the lateral branches. They have discovered as well that genetic correlation between trait pairs has been higher when compared to phenotypic correlation. Tomar *etal*. (2008) have carried out a genetic investigation of 50 genotypes in India and found that even though the phenotypic connection has been low, genetic correlation of melon plant has been strong for most of the variables under study. Mehta *etal*. (2009) hve conducted research in India on 44 genotypes of melon, examining genetic variations, genetic improvements, and heritability. They have discovered that genotypes varied a lot in terms of the traits, like the number of days until first harvest, fruit weight, length, and width, the number of the fruits for each one of the yields and plants, total soluble solids, and number of fruits of each one of the plants. In addition to that, they have found that the phenotypic and genetic variation had been high in fruit presentation characteristics and that coefficient of phenotypic and genetic variation has been high for every plant's fruit yield, succeeded by the number of fruits for each plant and acidity. Furthermore, the rate of heritability in the general sense has been high, exceeding 75% for all traits that have been examined, except fruit length, which gave the lowest percentage of inheritance and the general average as a percentage. The predicted genetic improvement was greatest for fruit yield per plant, acidity, total sugars, and fruit quantity per plant, in that order. The raucano variety beat the 642 Hybrid, packstar, in the length of the main stem of a study by Carcia et al. (2009) that evaluated four melon hybrids with some vegetative growth characteristics. However, there have been no significant differences between genotypes in the length of the secondary branches.

Because the environmental conditions for the expression of such features in melon plants overlapped, the phenotypic variation (PCV), as well as the coefficient of genetic variation (GCV), have been narrow (Prasad et al. 2004; Rajamony and Rakhi, 2005). Total soluble solids and genetic variance were found to be high in melon genotypes, as demonstrated by Glala et al. (2010). Ibrahim (2012) found that there were significant differences for 13 melon genotypes in each of the fruit lengths in the case when studying heritability, variations, and genetic improvement in the Egyptian sweet melon. Additionally, the coefficient of phenotypic variation has been higher compared to the coefficient of genetic variation for all studied traits that are represented by fruit's weight and number of fruits. Plant yield, fruit weight, fruit thickness, and fruit length were the characteristics with the highest general average as a percentage of expected genetic improvement. For each one of the plants, the yield of the plant, the width, length, and thickness of the fruit, and the general percentage of heritability in the broad sense have been extremely high for all examined traits. In India, Reddy *etal*. (2013) found that there was a statistically significant negative association between flesh thickness. According to Mohammadi et al. (2014), the ratio of heritability in the strict sense has been high for the trait of total soluble solids, and the analysis of variance between the genotypes of melon has been significant for characteristics of number of fruits, fruit weight, and total soluble solids. According to the findings of Abo Kamer *etal*. (2015), there was a high heredity rate for chemical features in five compositions of the melon plant, as indicated by the percentage of total soluble solids. Abo sedra *etal*. (2016) discovered that the heritability rate in broadest sense was high, reaching no less than 95% of such traits and that there have been statistically significant differences in nine genotypes of muskmelon plants with respect to total soluble solids content, flesh color, and general combined ability. According to Rao and Ramesh's (2018) analysis of 46 melon genotypes, they were high for fruit weight, fruit diameter, and length, number of fruits per plant, and weight of 100. They also found that the expected genetic improvement and the average genetic enhancement as percentage of genetic improvement. The thickness of the seed and fruit pulp (meat), as well as the high GCV and PCV values for variables under study and in the yield of a single plant, suggest that direct selection will be effective in enhancing these characteristics. According to Arvind et al. (2018), there have been significant statistical differences in the length of the plants, the thickness of the peel, the number of lateral branches on the main stem, and the number of fruits. The phenotypic and genetic variation coefficient has also been high for the peel's characteristic, succeeded by the fruit's average weight and the experimental unit's yield. The characteristics of fruit diameter, fruit length, and fruit thickness were predicted to have high genetic improvement.

When Janghil et al. (2018) examined the genetic diversity of melons grown in India, they found that there is a significant range in the size and width of each fruit. Furthermore, the fruit yield per experimental unit, fruit's average weight, and flesh thickness were found to have the highest coefficients of phenotypic and genetic variation. The fruit's size had the highest heritability in the broadest sense, succeeded by the experimental unit's results, the flesh's thickness, and the fruit's average weight. Fruit diameter, length, and flesh thickness had highest rate of percentage of expected genetic improvement, and number of fruits and fruit size for each had the second-highest percentage of expected genetic improvement. Fruit characteristics included average diameter, length, and flesh thickness, in that order. Average fruit weight, plant length, plant yield, experimental unit, and the number of main branches on every one of the plants. In their investigation into the inheritance of fruit yield and quality in muskmelon, Arzani and Akrami (2019) examined 66 genotypes of melon and discovered that there have been significant differences between genotypes in terms of fruit weight, length, yield, and width as well as in terms of meat thickness, total soluble solids, and heritability—defined as more than 60% for the majority of the traits examined. When researching the inheritance regarding a few qualitative traits in melon, Abo Sedera et al. (2019) in Egypt discovered that the heritability ratio has been generally high for the majority of the studied traits and that genotypes differed significantly in the majority of studied traits as indicated by the percentage of total soluble solids. The Suvarna strain was identified in every trait measured by Indraja et al. (2020) in India, including number of fruits per plant, percentage of total soluble solids, plant height, highest phenotypic and genetic variation, heritability, coefficient of variation, and improvement. This was done by analyzing the genetic variations of several horticultural characteristics in melon for 25 genotypes. The yield per plant, fruit's hardness, size, and quantity of fruits per plant all showed high levels of genetic improvement relative to the overall average of genetic improvement. Several studies (Dhillon *etal.*, 2009; Fergany *etal.*, 2011; Dwivedi *etal.*, 2010; Potekar *etal.*, 2014; Ansari *etal.* 2020; Venkatesa *etal.*, 2016) have found that genotypes differed a lot amongst themselves in each of the following: number of fruits for each one of the plants, the weight of fruit, plant height, the thickness of flesh, the length of the fruit to the fruit diameter, and the percentage of total soluble solids. For the genotypes of sophistication, the genetic variance has been smaller than environmental variance; in terms of fruit weight, the degree of heritability in the broad sense varied between less than 30% and more than 50% in certain crossings. Heritability efficiency as a percentage was greater than 60%, and rate of heritability in Egypt has been high for the following traits: number of fruits in each plant, fruit weight, weight of 100 seeds, seed weight per fruit, and seed yield for each plant.

This paper aims to study genetic behavior of seven melon genotypes that are grown in the environment of Mosul city / Iraq

MATERIALS AND METHODS

The study has been conducted in vegetable research field of Dept. of Horticulture and Landscape Engineering / College of Agriculture and Forestry / Univ. of Mosul throughout the spring of 2021 agricultural season.

Table 1 shows genotypes and genotypes of muskmelon and their sources

No.	Genotype Name	Sources
1	Alqoshy	Alqosh district, Nenavah government
2	Meloky	Alqosh district, Nenavah government
3	Sejeqal	Hatar village, Nenavah government
4	Walaty	Hatar village, Nenavah government
5	Pineapple	Local market, Duhok, Kurdistan region, Iraq
6	Mostaqbal	Local market, Mosul, Nenavah government
7	Hales Best Jumbo	Local market, Erbil, Kurdistan region, Iraq

On March 17, 2021, its seeds have been planted directly in the field using trays that measured one meter in width and three meters in length. One round and the next were separated by 50 cm. There were six plants per tray, two terraces for each type, and one meter separating one experimental unit from the next. The research was set up using a random sector design. Three replications of each experimental unit have been used for completing the results (Khalafallah and Al-Rawi, 2000). SAS 2000 system was used for statistical analysis, and Duncan's multiple test has been utilized for comparing the averages at 5% probability level. Robinson and Comostock (1952), Devane and Burton (1953), Burton (1952) on phenotypic variation, Allard (1960) on genetic variation coefficient, and Burton (1952) on heritability in the broadest sense were cited for recording genetic and phenotypic variances. Walter (1975) also evaluated the phenotypic and genetic correlations between the trait pairings. From each plot, five intermediate plants' worth of data were collected. The length of vine (in centimeters), the number of fruits on every one of the plants, the number of lateral branches on every plant, the fruit's diameter and length (in centimeters), average weight of the fruit (in kilograms), the pulp diameter (in centimeters), total soluble solids (TSS), the thickness of fruit's flesh (in centimeters), the weight of 100 seeds (in grams), the fruit yield (ton/dunum), the number of fruits per plant (in centimeters), seed length and diameter (in centimeters), and the taste characteristics were examined and ranked as follows: (1 = sweet, fibrous, 2 = sour, sweet, 3 = sweet, 4 = sweet).

RESULTS AND DISCUSSIONS

The statistical analysis of sources of variation is presented in Table 2, where it is evident that the genotypes and genotypes of the muskmelon plant appear to differ significantly among themselves at the probability 5% level for all the studied traits represented in length of the herb (cm), number of fruits for every plant, number of lateral branches for each plant, fruit diameter and length (cm), average fruit weight (kg), pulp diameter (cm), flesh thickness (cm), fruit yield (ton/dunum), weight of 100 seeds (g), total soluble solids (TSS), length and diameter of the fruit (cm), weight of each fruit (g), and average fruit weight (kg). The emergence of statistically significant differences in the sum of averages regarding the studied traits could be explained by such findings, which also provide evidence for the influence of genetic factors and their interaction with the local environmental conditions in research area. Based on the Duncan multiple limits test at the probability level of 5%, such findings came from After conducting a statistical analysis of the sources of differences for genotypes and genotypes in muskmelon, those who specified in their studies that there have been statistically significant differences (Shoemaker, 2002; Elizabeth *etal.*, 2003; Dwivedi *etal*, 2010; Fergany *etal.* 2011; Dhillon et al., 2009; Arvind et al. 2018; Janghil *etal.* 2018;, Ansari *etal.*, 2020; and Esho and Yousif, 2023) were satisfied with the results.

Figure 1: The shape of genotypes of muskmelon

Figure 2: The muskmelon genotype

Table 3 shows that the genotypes differed considerably amongst themselves in characteristics of the vegetative growth, fruit yield, and seeds. It may appear that genotypes 2 and 3 produced the highest length of vine, reaching 132.67 and 133.30 cm. They differed significantly from other genotypes or genotypes, while cultivar 1 gave the lowest length. For the vine, it reached 108.17 cm, and as for the number of side branches for each plant, variety 4 achieved the maximum number in that, which had amounted to 4, and was significantly superior to the remainder of the cultivars. But it did not differ with cultivar 2, the lowest number produced from cultivar 7 was 3.35, and the highest number of fruits per plant was produced by cultivar 7 and was 5.43. Variety 5 achieved the highest fruit weight, amounting to 2089.00 gm, and significantly outperformed most other cultivars, but it did not differ significantly from cultivar 2. Variety 7 produced lowest weight, amounting to 1029.7 gm per fruit. The genotypes also differed in their structure in the length of the fruit, and it appears from the same table that cultivar 2 produced highest fruit length of 20.30 cm and was a lot superior to all the genotypes under study. It reached 17.2 cm and significantly excelled with all the varieties under study. The lowest diameter in that was produced at class 7, which amounted to 12.53 cm. As for the characteristic of the thickness of the fruit flesh, class 1 achieved highest thickness of the fruit flesh at 4.37 cm and has been significantly consistent with classes 3 and 6, which produced less thickness amounted to 3.23 and 3.73, respectively. Whereas cultivar 2 has been significantly better than the rest of genotypes in terms of fruit pulp diameter, achieving the highest diameter of 9.17 cm and the lowest diameter produced by cultivar 1, which reached 5.53 cm. As for the TSS trait, class 5 was significantly superior to all the traits under study and produced the highest reading in that, which amounted to 11.37, and the lowest reading resulted in class 7, which amounted to 7.6. Cultivar 2 produced the highest fruit yield per dunam, reaching 3.56 tons per dunam, Significantly different from genotypes 4 and 5, and the lowest yield per unit area was produced by cultivar 3, which amounted to 2.49 tons/dunum. As for the characteristics of the seeds produced between cultivars, it appears from Table 3 that the highest seed weight for each fruit was produced by cultivar 5 and reached 37.7 grams, and this significantly outperformed the rest of the genotypes under study for this trait, while cultivar 3 produced the lowest weight, amounting to 14.43 grams. The highest weight of 100 seeds variety 2 achieved the highest weight, amounted to 3.90 grams, and was significantly superior to the rest of the varieties, while variety 3 achieved the lowest weight, amounted to 2.50 grams, and as for seed length, it achieved the highest length in that in variety 5, which amounted to 1.51 cm and significantly outperformed the rest of the cultivars. The least length in that was for class 4 and reached 1.10 cm. Also, cultivar 5 achieved the highest seed diameter of 0.80 cm and was significantly superior to all muskmelon genotypes under study. The lowest diameter produced in cultivar 6 was 0.45 cm. As for the seed yield per unit area, the highest total seed yield resulted in cultivar 5, amounting to 78.70 kg/dunum, and it excelled significantly with 1, 6 and 7, which produced the lowest yield in that. These results may explain the emergence of significant differences between muskmelon cultivars. The study may refer to the characteristics of vegetative and fruiting growth to the genetic factors carried by each cultivar and the extent to which the cultivar responds with its genetic factors to the prevailing environmental conditions in the area of implementation of the study, as well as to the gene expression in each cultivar on the trait that is controlled by the gene. And also to the effect of the interaction of multiple or accumulated genes, which have a direct effect on the productive traits, especially the components of the yield, which are affected by a number of genes and the interactions between these genes, which differ from one variety to the other - in addition to the influence of the location of the gene, which has a direct or indirect effect on the trait, which may stimulate And it begins to express itself with an effect on a characteristic, as it may be due to the ability of each variety to absorb the nutrients available and ready in the soil of the implementation of the study with its activity, efficiency and high ability to benefit from These elements and their conversion into nutrients within the plant tissues, which support plant growth in the stages of its life cycle, as well as the ability and efficiency of each variety in good metabolism, as well as the role of the fluorogenic hormone responsible for flowering, which pushes the plant to produce the highest number of fruits, which is produced in the young leaves and moves into the tissues plant, which stimulates the specialization of buds and meristematic cells to produce flowering buds for each variety of melon. These results were in line with what was obtained by the researchers (Shoemaker, 2002 for the characteristic of the number of fruits per plant and the average weight of the fruit; Elizabeth *etal.,* 2003 for the characteristic of the number of fruits in each plant and the percentage of total soluble solids, Walter *et al*., 2004 for the characteristic of dry weight leaf area and fruit weight, Wilfred *et al*., 2005, for total soluble solids, Singh and Lal, 2005, for vine length and total sugars, Glala *etal*., 2011, for vine length and number of side branches for each plant, and with Al-Zubaidi, 2010 for the characteristic of herb length and number of lateral branches per plant, Abo-Sedera *etal.* 2019 for the characteristic of total soluble solids, Indraja *et al.,* 2020 for the characteristic of plant height, number of fruits in a plant, and TSS.

The genetic parameters

Table 4 shows the genetic indicators in the muskmelon genotypes under study. The highest phenotypic variation, $Б^2$ Ph, resulted in the traits: vine length, fruit weight, seed weight for each fruit, and total seed yield per unit area, which amounted to (118.889, 121203.127, 58.3886, and 67.0216), respectively, and the reading of the variance was consistent. Genetic $Б^2$G for the same traits. As for the coefficient of phenotypic and genetic variation PCV, GCV, it was high for the characteristics of fruit weight, fruit length, seed weight in each fruit, and seed diameter, which amounted to 30.113 and 22.7311 for fruit weight, 21.1604 and 21.0532 for fruit length, and 33.8603 and 33.5314. for the characteristic of the weight of the seeds for every one of the fruits and 23.4977 for the diameter of the fruit for the coefficient of phenotypic variation. Except for traits number of branches, diameter of fruit pulp, TSS, weight of 100 seeds, and total seed yield per unit area, where their values were medium, and they were low for characteristics of vine length, number of fruits per plant, diameter, and length of fruit, and seed length.

Concerning heritability ratio in general sense (H^2b.s), it has been high for all of the traits, as it exceeded 50%, but it was low for traits, the number of fruits per plant and the diameter of the fruit, which amounted to 19.3045 and 38.5834, respectively. As for genetic improvement only, it has been high for the characteristics of fruit weight, fruit length, seed weight per fruit, weight of 100 seeds, and seed diameter, which reached 35.347, 43.150, 68.404, 30.581, and 36.304%, respectively, and has been low for the rest of the studied traits.

Those results have been acquired by studying the genetic parameters in muskmelon cultivars, in which the coefficient of phenotypic and genetic variation and phenotypic and genetic variations were consistent with the findings of the following studies: Lal and Singh 2005 for vine length and total sugars; Naroi Rad *etal.* 2010 for the characteristic of vine length and the percentage of total soluble solids; Dhaliwal et al. 1996 for the number of fruits and fruit weight; Taha *etal*. 2003 for fruit weight and fruit number; Sundaram et al. 2011 for the characteristic of fruit diameter and length, and herb length.

Genetic correlation between pairs of traits

Table 5 shows genetic correlation coefficient between pairs of traits. It indicates that the length regarding the vine has been significantly and positively related to the fruit pulp diameter and fruit weight, reaching r = 0.742 and r = 0.44, respectively, and highly significantly and negatively correlated with fruit flesh thickness, r = - 0.704 and that the number of lateral branches for every plant has been significantly and positively associated with the fruit flesh thickness, r = 0.727, the fruit diameter, r = 0.910, the total yield of a ton per dunum, r = 0.797, and the diameter of the fruit pulp, r = 0.516, and negatively correlated with the fruit flesh thickness, r = 0.727. Pulp diameter, fruit flesh thickness, yield per unit area, TSS, seed diameter and length, seed weight per fruit, and total seed yield per unit area were all highly correlated with number of fruits. With the exception of the meat's thickness and the weight of 100 seeds, which had non-significant relationships, the weight of the fruit has been significantly and positively related to several of the characteristics under investigation. While there was no significant link found between weight of 100 seeds and seed length or pulp diameter, it did reveal a favorable association with several of the features under investigation. The yield, the thickness of flesh, the weight of 100 seeds, and total fruit yield per unit area were all positively related to the fruit diameter. Length and diameter of seeds and number of seeds per unit area show a strong negative correlation. The table indicates that the traits of total fruit yield, TSS, and fruit seed weight have positive, statistically significant correlations with meat thickness characteristics. The characteristic TSS was related to a significant positive correlation with the characteristics of diameter and length of fruit, total fruit yield, and the seed yield per unit area, and in a negative significant way with the characteristic of the weight of 100 seeds, reaching r = - 0.657. The characteristic of pulp diameter demonstrated a significant positive correlation with the characteristic of total fruit yield, reaching r = 0.529. The total fruit yield per unit area characteristic has been found to be significantly positively correlated with both the fruit's seed weight characteristic and the total seed yield per unit area. Additionally, the seed weight characteristic has been found to be significantly and positively correlated with the characteristics of seed length and diameter and seed yield per area, with r values of 0.667, 0.872, and 0.860, respectively. Finally, the weight of 100 seeds was found to be negatively correlated with the seed length, with r = - 0.480. The characteristic of seed yield per unit area (r = 0.852) was likewise significantly positively correlated with the characteristic of seed diameter.

Phenotypic correlations between trait pairs

The phenotypic correlation between the pairs of traits is displayed in Table 6, where it could be observed that the length of the vine has been negatively correlated with the characteristic regarding the thickness of seed flesh and positively correlated with fruit pulp diameter, with r-value of 0.664. A positive and statistically significant correlation (r = 0.700) was found between the number of lateral branches and the fruit diameter characteristic for every plant. The phenotypic correlation table also shows that fruit weight characteristic has been positively and significantly associated with each of the following characteristics: r = 0.435 for TSS, r = 0.758 for fruit length, and r = 0.572 for total fruit yield. The weight of seeds in the fruit was r = 0.662, and r = 0.435 for total seed yield per unit area. Additionally, a substantial positive correlation (r = 0.694 and r = 0.475, respectively) has been found between the fruit length characteristic and fruit pulp diameter and total fruit yield features. It has additionally been connected to an adjective. Fruit yield per unit area, fruit seed weight, and TSS characteristics all positively correlate with fruit flesh thickness. The TSS trait showed significant positive phenotypic correlations with each of the following characteristics: r = 0.663, r = 0.713, r = 0.816, and r = 0.520, respectively, and negatively significant correlations with the weight of the seeds for each of the characteristics of the total fruit yield per unit area, length and diameter of the seed, and total seed yield per unit area. A fruit of r=-0.582 was attained. Additionally, there were noteworthy positive phenotypic correlations (r = 0.617 and r = 0.497, respectively) between the fruit production, ton per dunum, and the fruit's seed weight features, as well as the total seed output per unit area. Regarding the fruit's seed weight characteristic, it has been found to have a strong positive phenotypic correlation to the length characteristic. The diameter of seed and the total seed yield per unit area. At r = 0.688, a substantial positive correlation was seen between seed length and diameter .

The genetic and phenotypic correlation is a statistical indicator that allows determining the direction and strength of the relation between at least two traits, and this prepares plant breeders for the possibility of introducing indirect selection for traits with heritability ratios higher than the value of (0) and associated with the yield in the plant (Adams and Grafius, 1971), through tables (5, 6) of the phenotypic and genetic correlations between pairs of traits in muskmelon plant that the total fruit yield per unit area has been positively associated genetically and phenotypically with most of the traits that were studied. Our results were consistent with both (Tomar *etal.* 2008; Reddy *et al*. 2013; Rukam *etal.,* 2008; Indraja *etal*. 2020; Parajapati *et al*. 2020; and Yousif and Esho 2023), who indicated that total muskmelon yield was genetically and phenotypically correlated positively with some Characteristics of the components of the yield, fruits, and seeds.

Table 1. Anova table

SOV	df	Mean														
		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
Blocks	2	27.10048	1.7619	1.7143	12614.143	0.1900	8.6852	0.3186	0.1772	0.2805	0.2893	1.7319	0.6029	0.0075	0.0052	109.126
Genotypes	6	322.09158**	0.9683*	0.8571**	455115.524**	31.9371**	0.190*	0.5254*	4.4544*	4.9022**	0.7878*	172.910**	0.811**	0.0552*	0.041**	136.53*
Error	12	17.2866	0.20635	0.5476	91506.143	0.1083	0.2133	0.0747	0.0999	0.1727	0.1558	1.1286	0.0510	0.0056	0.0041	32.2679
Total	20															

Table2. Average value of the traits of the muskmelon genotype. *

Genotypes	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
1	108.17 c	3.67 bc	4.33 ab	1347.3b	15.87c	12.93d	4.37 a	5.53 e	8.27 cd	2.37 b	19.03cd	3.37b	1.25 b	0.56b	65.02bc
2	132.67a	4.33 ab	4.76 ab	2040.7a	20.30a	17.20a	4.23 ab	9.17 a	8.07 cd	3.56 a	25.00b	3.90a	1.15 bc	0.49b	75.90ab
3	133.30a	3.67 bc	3.56 b	1341.3b	14.13d	13.87c	3.23 c	8.40 b	9.43 b	2.49 b	14.43e	2.50c	1.27 b	0.52b	69.87ab
4	108.97c	5.00 a	4.29 ab	1426.3b	13.47b	15.77b	4.40 a	7.93 bc	8.53 c	3.48 a	24.03b	3.17b	1.10 c	0.50b	69.13a-c
5	124.67b	3.70 bc	4.81 ab	2089.00a	19.53b	13.37cd	4.20 ab	7.50 c	11.37a	3.45 a	37.70a	2.60c	1.51 a	0.80a	78.70a
6	125.03b	3.68 bc	5.00 ab	1446.7b	12.03f	13.33cd	3.73 b	8.13 b	8.10 cd	2.59 b	17.67d	2.67c	1.14 bc	0.45b	58.40c
7	120.87b	3.35 c	5.43 a	1029.7b	12.97e	12.53	3.93 ab	6.53 d	7.60 d	2.89 ab	20.10c	3.44b	1.24 bc	4.49b	67.37bc

Table 3. The genetic parameters for muskmelon traits.

Genetic parameters	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
Mean	122.138	3.905	4.571	1531.571	15.471	14.143	4.014	7.60	8.767	2.975	22.567	3.091	1.237	0.545	69.198
R-Square	0.9054	0.790	0.566	0.715	0.993	0.953	0.809	0.958	0.935	0.739	0.987	0.909	0.837	0.839	0.728
Coeff. Var.	3.404	11.633	16.188	19.751	2.127	3.266	6.808	4.159	4.740	13.267	4.708	7.308	6.052	11.785	8.209
σ^2 Ph.	118.889	0.460	0.6786	212709.27	10.7173	0.3473	0.2247	1.5519	1.7492	0.3664	58.3886	0.304	0.0221	0.0164	67.0216
σ^2 Ge.	101.602	0.254	0.131	121203.127	10.609	0.134	0.150	1.452	1.5765	0.2106	57.260	0.253	0.0165	0.0123	34.7541
P.C.V.	8.9272	0.1737	0.1802	30.113	21.1604	4.1669	11.8093	16.3915	15.0858	20.3465	33.8603	17.8377	12.0178	23.4977	11.8308
GCV	8.2528	12.9061	7.9182	22.7311	21.0532	2.5883	9.6487	19.1053	14.3217	15.4256	33.5314	16.2728	10.3842	20.3496	8.5194
H^2 b.s.	85.4595	55.2174	19.3045	56.9807	98.9895	38.5834	66.7557	67.7879	90.1269	57.4782	98.0671	83.2237	74.6606	75.00	51.8551
Genetic advance	15.716	19.756	7.167	35.347	43.150	3.312	16.240	22.890	28.009	24.091	68.404	30.581	18.484	36.304	12.638

Table 5 Genotypic Correlations Matrix

	x1	x 2	x 3	x4	x 5	x 6	x 7	x8	x 9	x 10	x 11	x12	x 13	x 14
x 2	-0.340NS													
x 3	-0.041NS	-0.833**												
x 4	0.444*	0.286NS	-0.453*											
x 5	0.341NS	0.147NS	-0.157NS	0.964**										
x 6	0.258NS	0.910**	-0.340NS	0.649**	0.460*									
x 7	-0.704**	0.727**	0.739**	0.390NS	0.440*	0.361NS								
x 8	0.742**	0.516*	-0.307NS	0.579**	0.232NS	0.736**	-0.332NS							
x 9	0.227NS	-0.105NS	-0.513*	0.683**	0.477*	-0.155NS	-0.063NS	0.103NS						
x 10	0.052NS	0.797**	0.469*	0.733**	0.640**	0.829**	0.557**	0.529*	0.339NS					
x 11	0.008NS	0.193NS	0.340NS	0.827**	0.692**	0.166NS	0.598**	0.068NS	0.694**	0.848**				
x 12	-0.195NS	0.316NS	0.642**	0.016NS	0.333NS	0.527*	0.632**	-0.079NS	-0.657**	0.308NS	-0.018NS			
x 13	0.190NS	-0.604**	-0.229NS	0.472*	0.499*	-0.495*	-0.052NS	-0.265NS	0.928**	0.092NS	0.667**	-0.480*		
x 14	-0.013NS	-0.155NS	0.050NS	0.716**	0.637**	-0.249NS	0.254NS	-0.224NS	0.944**	0.347NS	0.872**	-0.391NS	1.091**	
x 15	0.396NS	0.105NS	-0.297NS	0.963**	0.974**	0.463*	0.404NS	0.346NS	0.697**	0.924**	0.860**	0.143NS	0.683**	0.852*

Table 6 Phenotypic Correlations Matrix

	x 1	x 2	x 3	x 4	x 5	x 6	x 7	x 8	x 9	x 10	x 11	x 12	x 13	x 14
x 2	-0.172NS													
x 3	-0.084NS	0.029NS												
x 4	0.342NS	0.264NS	0.170NS											
x 5	0.301NS	0.093NS	-0.053NS	0.758**										
x 6	0.202NS	0.700**	-0.167NS	0.365NS	0.437*									
x	-	0.185N	0.025N	0.256N	0.376N	0.217N								

7	0.520*	s	s	s	s	s								
x8	0.664**	0.349NS	-0.140NS	0.395NS	0.220NS	0.694**	-0.290NS							
x9	0.168NS	-0.069NS	-0.279NS	0.435*	0.458*	-0.085NS	-0.042NS	0.122NS						
x10	0.191NS	0.428NS	0.057NS	0.572**	0.475*	0.475*	0.516*	0.404NS	0.158NS					
x11	-0.020NS	0.140NS	0.182NS	0.662**	0.690**	0.154NS	0.494*	0.058NS	0.663**	0.617**				
x12	-0.101NS	0.273NS	0.165NS	0.085NS	0.295NS	0.419NS	0.518*	-0.075NS	-0.582**	0.379NS	-0.003NS			
x13	0.127NS	-0.392NS	0.065NS	0.275NS	0.432NS	-0.408NS	-0.006NS	-0.266NS	0.713**	0.023NS	0.579**	-0.383NS		
x14	-0.002NS	-0.246NS	-0.173NS	0.385NS	0.540*	-0.217NS	0.282NS	-0.179NS	0.816**	0.259NS	0.758**	-0.271NS	0.688**	
x15	0.268NS	0.337NS	-0.138NS	0.435*	0.661**	0.393NS	0.091NS	0.248NS	0.520*	0.497*	0.586**	0.160NS	0.395NS	0.413NS

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