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Genetic Analysis in Some Varieties of Pepper (*Capsicum annum* L.)

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Abstract: ***The present study was carried out at the vegetable field research, horticulture and landscape design, College of Agriculture and Forestry, Mosul University during growing season spring 2019, ten pepper genotypes were collected from Mosul area and from farmers, to estimated genetic analysis in pepper genotypes. The result showed there was significant among the genotypes for all the traits under the studied. The genotype Peperno Quadrato Giallo gave the high value in number of branches per plant (9.133) and in fruit weight (59.433 g.). while the genotype Pepperno Quadrato D3 ti Rosso was supervise for the number of fruit per plant (142) and in fruit diameter (5.2 cm.). The genotype Peperone Friariello gave the high mean value in fruit length (13.967 cm), total yield (7.433 ton/donum) and in percentage of Vitamin C. (93.333 mlg./100 g. fresh weight). Whoever, the phenotype Б^{2}p and genotype Б^{2}g were higher for the plant height (cm.), number of fruit per pant, fruit weight and in vitamin C., also the PCV GCV take the same line of the results. the heritability in broad sense was more than 50% for all traits under the studied. The genetic advance was higher for plant height, fruit weight and in vitamin C.***

Keywords: Genetic, Pepper, Analysis, Varieties

1. Introduction

Capsicum species are members of the Solanaceae a large tropical family that includes tomato, potato, eggplant. Peppers are an important cash crop for smallholder farmers in developing countries, hot pepper 'chili ' dominates world spice trade and sweet pepper has become a popular vegetable and cash crop in the tropics for smallholders (Lin *et al*., 2013).It grows well under warm and high humid condition, but requires dry weather at maturity. The sweet pepper is an excellent source of vitamins A and C and is rich in health promoting antioxidant compounds (Nadeem *et al*., 2011). It gives best green fruit yield and better seed set at 21^{o}c to 27^{o}c during the day and 15 to 20^{o}c at night (Paul and Eric, 2012). Pepper traits with large diversity of fruit shape, colour and attitude, directions of production, processing and consuming (Krasteva *et al*., 2012). The most recent FAO statistics (FAOSTAT, 2014) indicate that more than 32.3 million tones of fresh fruit is produced on 1.94 million hectares, worldwide. To improve the crop have been constrained mainly by a lack of adequate information on the genetic and inheritance traits of the plant, increased numbers of fruits, numbers of seeds per fruit and single fruit weight have associated impacts on fruit yield, but, for significant advance to take place, genetic information and efficient breeding methods are required. However, efforts to improve the crop have been constrained mainly by a lack of adequate information on the genetic and inheritance traits of the plant, increasing numbers of fruits, and single fruit weight have associated impacts on fruit yield but, for significant advances to take place, genetic information and efficient breeding methods are required. The yield variation among varieties could be due to genetic makeup of varieties and the ability to adapt environmental conditions (Tesfaw *et al*., 2013). Gebremeskel *et al*., (2015) reported the mean value of fruit diameter can significantly affected by varieties. Broad-sense heritability were high for plant height, day to flowering and medium for fruit length and diameter in pepper (Syukur and Rosidah, 2014). Alemu *et al*., (2015) founded in their studies there were highly significant difference among varieties on parameters of fruit length, fruit diameter, number of fruits per plant, fresh fruit yield. Total fruit weights averaged just over 100 g of marketable fruit per plant for the three sweet pepper varieties the Revolution variety had the highest marketable fruit weights per plant this was followed closely by Mavras variety, while the variety Pimiento heirloom a distinct type from the two hybrids, yielded less than one third of top performer (Kenneth, 2017). Kahsay (2017) indicated when he evaluation five varieties of pepper, there was significant difference on days of 50% flowering, fruit length, fruit diameter, fruit weight, number of fruits per plant, plant height and total yield among the varieties. Improvement in yield and quality is the main objective at which plant breeder aims, by altering their genetic architecture. Aklilu *et al*., (2016) refers in their studied that the genetic component analysis indicated that the phenotypic coefficient of variation (PCV) was higher in magnitude that genotypic coefficient of variation (GCV) for the some traits, higher magnitude of GCV was observed in number of branches, plant height, and broad sense heritability was higher for fruit length, plant height and fruit diameter, however, genetic advance as percent of the mean (GAM) was high to moderate for number of branches, fruit diameter and weight. Information on nature and magnitude of variability present in the material and association among the various traits is a pre-requisite for any breeding programme. the success in crop improvement programme depends, chiefly on the availability of genetic variability in the crop (Rohini *et al*., 2017).

The aim of this study was to study the genetic analysis in some varieties of pepper under the condition of Nineveh government, Iraq.

2. Materials and Methods

The present study was carried out at the vegetable field research, horticulture and landscape design, College of Agriculture and Forestry, Mosul University during growing season spring 2019, ten pepper genotypes were collected

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from Mosul area and from farmers, (table 1), to estimated genetic analysis in pepper genotypes.

Table 1: Source of the seeds of the genotypes of pepper

No.	The name of genotype	Source
1	Antaqia	Shahbaa copanay, Syria, Alpepo
2	Qurn Ghassal syrian	Shahbaa copanay, Syria, Alpepo
3	Every Green	Arbel Garden, Arbel, Kurdistan, Iraq
4	Zhong Jiao	Hong Tu Seed
5	Pepperno Quadrato D3 ti Rosso	Pagarro Gostaulino and Fllisp Etalia
6	Peperno Quadrato Giallo	Pagarro Gostaulino and Fllisp Etalia
7	Qurn Ghassal Mosuly	Rasheedia, Mosul, Nenevah, Iraq
8	Marconi Rosso	Pagarro Gostaulino and Fllisp Etalia
9	Peperone Friariello	Pagarro Gostaulino and Fllisp Etalia
10	Peperon Icineco Ornamentale	Pagarro Gostaulino and Fllisp Etalia

The experimental design was a randomized block design (R.C.B.D.) with three replication, the seed of ten genotypes were sown in 15/ February under plastic house on a seed bed size of (50 cm x 50cm) until the seedling were ready for transplanting. Transplanting to main filed was done when seedling reached from 20 to 25 cm height and or at 50 days after sown. The number of plant per plot for each genotype was 10 plant under drip irrigation, the space between plants was 30 cm. 75 kg/donum of DAP was used as fertilizers a side dressing during the transplanting, and out of 25 kg/donum of Urea as the source of (N). Half was applied after 15 days of transplanting time and the half when plant beginning flowers, all agronomic practices such as supplemental water irrigation, weedling, and protection were implemented according to the farming field (Matlob, et al., 1989).

Data were collected from the 5 middle plant for each plot for the:- plant height (cm), number of branches per plant, days of 50 % of plants were flowering, number of fruits per plant, diameter, length, and weight of fruit, total yield of fruits /donum, and, vitamin C per 100 gram fresh weight of fruit, were collected and analyzed SAS (2017). Estimated of the genotypic and phenotypic variation according to Comostock and Robinson (1952), genotypic and phenotypic coefficient variation (GCV, PCV) were calculated based on the method advocated by Burton (1952), the range of GCV and PCV values were classified as low, moderate and high (Less than 10% low, 10-20 % moderate, and more than 20% high, heritability (broad sense) according to Hanson *et al.* (1956) the range of heritability were classified as, $H^2_{b.s.}$ = or > to 40% was low, $H^2_{b.s.}$ = 40-60% was medium and more than 60% was higher, and genetic advance by Johnson *et al.* (1955).

3. Results and Discussion

Anova analysis

The analysis of variance (ANOVA) for the yield and yield contributing traits indicated significant differences among genotypes for all the characters studied (Table 1). Expressive variance was also observed for pepper genotypes, This variation could probably the due to the presence of gene modifying factors of pungency. Sufficient genetic variability for many traits had also been reported by Sreelathakumary, 2000; Manju and Sreelathakumary 2002; Ullah et al., 2011; Soares *et al.*, 2017, Aditita et al., 2018.

The mean value of the traits

Table (2) showed the mean value of the trait for the 10 genotypes of the pepper, the plant height varied between 54.433 and 108.967 cm, the genotype 7 had higher plant height (108.967 cm.). Genotype 6 had the highest number of branches per plant (9.133). However, minimum value was recorded in genotype 3 (5.900). The genotype 3 was earliest in first flowering (77.333 days). The genotype 10 took the longest time to first flowering (90.120 days). Earliness or lateness in days to 50% flowering might have been due to the inherited characters, early acclimatization to the growing area to enhance their growth and development. High number of fruit was found in genotype 5 which gave (142.000 fruit /plant). However, minimum number of fruits was observed in genotype 8 (85.330 fruits/plant). The highest fruit number per plant in genotype 5 was most likely due to the fruit bearing capacity of the genotype and number of branch formation nature which leads to contain high number of fruit per plant, and might due to the associated traits like canopy that could limit number the number of branches, the temperature stress of the growing environment and the capability of each genotype to with stand the stress especially on the reproductive development, which is more sensitive to high temperature stress (day and night temperature) than vegetative development. Also in table 2 indicated that the genotype 8 gave the height length in fruit (13.967 cm.), while the genotype 3 gave the minimum length (4.267 cm.). Pepper genotypes attributed to the inherited traits and adaptability to the environmental condition of the study area. The genotype 5 recorded highest value in fruit diameter (5.200 cm.), however, the genotype 6 recorded lowest diameter of fruit (1.200 cm.). The genotype 6 had higher fruit weight (59.433 g.), while the genotype 7 had lowest fruit weight (12.433 g.). The studied indicated that the genotype 8 had the highest value in total yield per unit area (7.433 ton/donum (2500 m^2), However, the genotype 3 gave the lowest value in that which was (4.867 ton). The variation of the yield of these genotypes could be due to difference in genetic traits and factors, agro ecological adaptability nature. High Vit. C content was found in genotype 8 (94.333 mg/100 g). However, minimum value was record in genotype 5 (63.200 mg/g). This results were in agreement with; Yatung *et al.*, 2014; Seleshi *et al.*, 2014; Syukur and Rosidah, 2014; Al-Shammary, 2015; Gebremeskel *et al.*, 2015; Kahsay, 2017; Kahsay, 2017; Richardson, 2017.

The genetic parameters

Genetic parameters which include the phenotypic variance ($Б^2p$), genotypic variance ($Б^2g$), genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), broad sense heritability ($H^2_{b.s}$), expected genetic advance (GA) and the genetic advance as the mean value were estimated for all 9 traits are present in table (3). Analysis of variance showed significant variance among the genotype of pepper for most the traits the highest ($Б^2p$) and ($Б^2g$) were observed in plant height. A wide range of variability was recorded in plant height (44.100 – 106.733 cm.). Number of branches per plant (5.900- 9.133), number of days for 50% flowering (77.333- 90.120 days), number of fruits per plant

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(85.330 – 142.00), fruit length (4.267- 13.967cm.), fruit diameter (1.200- 5.200 cm.), fruit weight (12.433- 59.433 g.), total yield (4.867- 7.433 ton/donum) and the Vit C (63.200- 94.333 mlg/100 g). A perusal of the data revealed that the magnitude of ($Б^2p$), ($Б^2g$) were higher in plant height, number of fruits per plant, fruit weight, Vit. C. In others it differed slightly, altogether suggesting low to medium influence of environment in the expression. Higher (PCV) and (GCV) values were recorded in fruit weight, fruit diameter, fruit length followed the traits plant height, number of fruit per plant and in total yield. Higher magnitude of (PCV) and (GCV) indicated the existence of substantial variability that could be potently exploited through direct selection when used the breeding programmed. The coefficient of variation compares the relative amount of variability among the genotypes, it also measures the potential for favorable advance in selection. The results further confirmed the findings of researches as Ngozi and Uguru, 2006 for plant height, number of fruit per plant and fruit length. Sharma *et al*. 2010 in fruit weight; Yatung et al. 2014 for the days to first flowering, plant height and number of fruit per plant; Aklilu *et al*., 2016 recorded in fruit diameter, fruit weight and in number of fruit per plant, Sahu *et al*. 2016; Razzak *et al*. 2016 in fruit length; Meena *et al*. 2016 fruit length and plant height and Rohini *et al*., 2017; in plant height. Although the GCV helps to measure the genetic variability in a trait, it is not enough to permit partition the heritable variation.

High estimates of broad sense heritability was more than 52% for all traits, which indicate that substantial improvement can be made using standard selection procedures. High heritability estimates were also recorded by researchers for plant height, number of days for 50% flowering, fruit length, diameter, weight, and total yield. Yatung *et al*. 2014; Amit *et al*. 2014; Meena *et al*. 2016; Aklilu *et al*. 2016. and Khan and Sridevi, 2018. The high estimates of genetic advance were for plant height, fruit weight, number of fruit per plant and in Vit C., and high genetic advance as percent of mean were observed for maximum traits except number of days for 50% flowering, number of fruits per plant and number of branches per plant, which were 8.808%, 22.151 % and 23.104 respectably. This suggested the presence of additive gene action and hence these traits are likely to respond better to selection.

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