Available online at http://www.journaldynamics.org/jdar
Journal of Dynamics in Agricultural Research Vol. 3(3), pp.41-45, November 2016
Article ID: JDAR/JDYA27295993

ISSN: 2488-9776

Original Research Paper

Correlation and Genetic Parameters in Summer Squash (*Cucurbita Pepo* L.)

Kamal Benyamin Esho[1]* and Safwan Hazem Saeed[2]

[1,2]College of Agriculture and Forestry, Horticulture and Landscape Design, Mosul University, Iraq.

*Corresponding Author. E-mail: kamalesho@rocketmail.com.

Received 14 September, 2016; Accepted 27 October, 2016; Available on-line 10 November,2016

ABSTRACT

The study was carried out in the private farm of Somail, Dohuk government, during growing fall season 2015. The aim was to study the correlation and genetic parameters in summer squash, using three cultivars (Alexandria F1, Khatoon F1 and Ardendo 174 F1). The results showed that the variety Ardendo 174 F1, is the best in all traits v.z. Plant height, leaves per plant, fresh and dry weight per plant, male and female flowers per plant, number of fruits per plant, fruit weight, yield per plant and total yield per unit area. The σ2 G, σ2 P were higher for all traits except the leaves number per plant, sex ratio and number of fruits per plant. The heritability (H2b.s) was higher in all characters except in the plant height, leaves number per plant, and fresh weight per plant. The results indicated a higher positive significant phenotypic correlation coefficient between the total yield per unit area with all traits. While the sex ratio gave a negative significant phenotypic correlation coefficient between plant heights, leaves number, fresh weight, dry weight, and female flowers per plant.

Key words: cucurbita, genetic parameters, correlation.

INTRODUCTION

Summer squash (*Cucurbita pepo* L.) is one of the most widespread and important vegetable crops. This crop belongs to the family Cucurbitaceae, and has been regarded as highly polymorphic vegetable grown during summer and fall in Iraq and is harvested when the fruits are physiologically immature (Kathiravan *et al.,* 2006). It is eaten as a vegetable, either boiled, fried or stuffed, it has various health benefits to human as well as medicinal potentials (Mohammed *et al.,* 2011). It is rich in nutrients and bioactive compound contents such as phenolics, flavonoids, vitamins (including ß-carotene, vitamin A, B2, C, and vitamin E), amino acids, carbohydrates, and it is low in energy content (about 17 Kcal/ 100g of fresh pumpkin) and has large amount of fiber (Tamil *et al.,* 2012). It has various medicinal effects comprising antidiabetic, antitumor, antibacterial, intestinal antiparasitic, antalgic and utilization possibilities of various Cucurbitaceae species have been reported. Improvement of summer squash production per unit area has been the objective of many recent studies like new suitable cultivars under the growth conditions.

This could be achieved by using high yielding cultivars with good quality and/or the application of better cultural techniques. Acknowledging the nature of the correlation between yield and its components is of great necessary in any breeding program. The extent of association is measured by correlation coefficients. Correlation studies provide information that selecting one trait will result in progress for all positively correlated traits. Many of the traits are correlated because of mutual correlation,

positive or negative, with other traits. Abdullah *et al.,* (2002) reported a positive phenotypic correlation between the total yield with plant length, number of leaves per plant and leaf area in their study which involved five lines of (*Cucurbita moschata*). Espitia (2004) also working with *Cucurbita moschata* found that genetic correlation were superior in both magnitude and significance when compared with phenotypic and environmental correlations, the fruit weight per plant presented high phenotypic correlation with average fruit weight and number of fruits per plant. Camacho et al., (2006) found a positive and significant phenotypic correlation between the total yields of pumpkin with each of average fruit weight, the number of fruits per plant. Hazara *et al.,* (2007) in their study of 36 pumpkin cultivars, observed that fruit weight and a number of fruits per plant were positively and significantly correlated. Refai and Mohamed (2009) investigated in their study on summer squash inbred line, there was the different between them in fruit length m fruit diameter, number of fruit per plant, early yield, and total yield per feddan. Marie and Mohammed, (2010) found significant correlation positively which were obtained between the total yield and its contributing traits viz, (number of female flowers, sex ratio, number of fruits per plant, fruit weight and early yield. Aruah *et al.,* (2012) found in their study that heritability estimates were low in a number of male and female flowers, a significant positive correlation was also obtained between the number of female flowers and the number of fruits per plant. There is a wide genetic variability among the existing pumpkin accessions (Bonilha *et al.,* 2009; Aruah *et al.,* 2010; Abd El-hamed and Elwan, 2011). Yoldas (2014), repeated in his study the varieties of summer squash had statistical significant effects on yield, the highest yield was obtained from var. STR-07-6001 F1, moreover, increasing the yield of fruit in fruit diameter, fruit length. Grisales *et al.,* (2015) found there was a significant positive correlation between number of fruits per plant and plant production, plant dry matter, and also indicated a significant positive genetic correlation between plant production and fruit dry matter, plant dry matter, and crude protein, in summer squash.

The aim of this study was to investigate the correlation and genetic parameters in summer squash (*Cucurbita pepo* L.) at the condition of Duhok government, Kurdistan, Iraq.

MATERIALS AND METHODS

The experiment was conducted at the private farm of Somail, Duhok at Latitude 36 51 38 N, Longitude 42 52 02 E, Altitude 473 (Agro, 2015), Kurdistan region, Iraq during fall season 2015. Three varieties of summer squash were investigated to study the correlation and genetic parameters among different traits. The cultivars were arranged according to Randomized Complete Block Design (RCBD) with three replicates. Comparison among means was made using Duncan's multiple range tests at 0.05 probability level. The land was disc plowed, harrowed, and then divided into growing units consisting one ridge (4 x1 m) of 12 plants with 30 cm intra plant spaces. Other agricultural practices were similarly carried out on each experimental unit as followed by farmers in the area (Matlob *et al.,* 1989). Four plants were selected at random, and observations were recorded on 16 traits viz , plant height (cm), number of branches per plant, Number of leaves per plant , leave area, leaves area per plant , male and female flowers per plant, sex ratio, fruit length and diameter (cm), early yield , total yield per hectare ,T.S.S ,concentration of N, and proteins . All statistical analysis carried out with the help of (SAs V. 9.o), (Statistical Analysis System, 2001). Phenotypic and genotypic coefficients of variation were estimated by following the procedure given by Burton (1952). Heritability in broad sense (h2 b.s.) by Burton and Devane (1953) , if (h2 b.s.) = or > to 40% was low , (h2 b.s.) = 40-60 was medium , more than 60% was higher .The correlation coefficients were estimated following the method by Al-Jibouri *et al.,* (1958).

RESULTS AND DISCUSSION

The results presented in Table (1) showed the mean value of traits of the test cultivars. There was a significant difference in the traits under study, except the plant height, the plant height of the cv. Alexanderia F1 was lower than other cultivars. The results showed that the cv. Ardendo 174 F1 gave a higher in most traits v.z. Leaves number per plant, fresh and dry weight, male and female flowers per plant , numbers of fruits per plant, fruit weight, yield per plant, and in total yield (tons / hectare). These results were in agreement with Mutschler and Pearson (1987), Khalil *et al.,(*1996),Yoldas *et al.,* (2000), Yoldas (2014), for the vegetative characters , and with Agbagwa and Nudkwu (2004) that reported the flowering traits, Precheur *et al.*, (2007), who reported that differences in the fruit number were mostly influenced by the variety, while Refai and Mohamed (2009), Bonilha *et al.,* 2009 ; Aruah *et al.,*2010; and Aruah *et al.,* (2010) they reported in their study the variations in qualitative traits showed higher discrimination. The significant genotype effect of the number of male flowers is an indication of varietal differences existing among the genotypes cucurbita under this study.

Table (2) showed the genetic parameters in cucurbita cultivars , the highest estimate of genotypic variance (σ2 G) were observed for total yield per unit area (7370.389), fruit weight (834.948), male flowers per plant (139.363) and dry weight per plant (395.546), magnitude of phenotypic variance for the plant height , leaves per plant , fresh weight , dry weight per plant , male flowers , fruit weight and total yield per unit area were higher than environmental variance. The environmental variance of the above traits was observed to be very low indicating

Table 1. The mean of traits of squash plant. *

Variety (genotype)	Plant height (cm)	Leaves /plant	Fresh weight /plant (gm)	Dry weight /plant (gm)	Male flowers /plant	Female flowers /plant	Sex ratio	No.of fruits /plant	Fruit weight (gm)	Yield /plant (kg)	Total yield (ton /hectar)
Alexandrie F_1	34.875 a	22.903 b	708.72 b	92.247 b	15.792 b	17.222 b	1.239 a	8.99 c	139.91b	1.258 c	6.558b
Khatoon F_1	37.139 a	23.875 b	705.56 b	95.11 b	16.792 b	18.778 b	1.170a	11.56 b	163.22 a	1.887 b	7.76 ab
Ardendo 174 F_1	35.764 a	24.236 a	810.50 a	108.967 a	24.653 a	19.708 a	0.805 b	13.32 a	162.01a	2.158 a	8.99 a

* Significant at 5% level.

Table 2. The genetic parameters for some traits in genotypes of cucurbita in the 2015 fall planting season.

Genetic parameters	Plant height (cm)	Leaves /plant	Fresh weight /plant (gm)	Dry weight /plant (gm)	Male flowers /plant	Female flowers /plant	Sex ratio	No.of fruits /plant	Fruit weight (gm)	Yield /plant (kg)	Total yield (ton /hectare)
σ^2 G	2.542	0.862	19.635	395.546	139.363	8.421	0.295	1.24	834.948	0.047	7370.389
σ_2 P	17.334	3.853	1765.87	479.742	141.316	9.467	0.332	1.469	1032.322	0.06	8892.651
σ^2 E	14.791	2.991	1736.237	84.196	1.953	1.046	0.037	0.229	197.374	0.013	1522.262
GCV	4.438	3.922	0.598	201.35	61.875	15.628	50.713	25.634	18.637	30.839	1104.903
PCV	11.589	8.290	5.661	22.175	62.307	16.57	53.800	27.901	20.723	34.756	1213.653
ECV	10.705	7.306	5.635	0,929	7.345	5.508	17.977	38.592	9.061	16.030	502.139
$H^2_{b.s.}$	14.663	29.591	1.119	82.449	98.618	88.95	88.059	84.44	80.881	78.726	82.882

that the environment had very little effect on the observed phenotypic variations of the traits. This would therefore suggest that the above traits have broad variation and hence improvement can be achieved through the imposition of selection on the characters. The phenotypic coefficient of variation was highest in total yield (1213.653) followed by male flowers per plant (62.307) , sex ratio (53.800), yield per plant (34.756) ,the number of fruits per plant (27.901), and dry weight per plant (22.175). High PCV is an indication of the existence of wide scope of selection for the improvement of the characters from a considerable amount of variability present. The same result was repeated by Aruah, *et al.,* (2010), Aruah *et al.,(*2012), and Yoldas (2014). A comparatively low GCV observed for plant height, leaves per plant, fresh weight per plant, and fruit weight, is indicative of less scope for improvement. The genotypic coefficient of variation provides a measure of genotypic variability present in various quantitative traits. In the Table (2) it showed that the high heritability in broad sense value was recorded for most traits under study, except for plant height and fresh weight per plant. The high heritability estimates obtained in some of the characters are indications that selection could be effective for improving such traits. These traits had high heritability, therefore, effective selection may be made for them and suggested that these characters could be controlled by additive genetic effect and can, therefore, be used for improvement through phenotypic selection. When heritability of traits is medium to high, selection based on individual level of performance allows a relatively rapid rate of improvement. Higher heritability is known to be important in selection of superior genotypes based on phenotypic performance. The high genotypic and phenotypic variation , heritability in board sense for quantitative traits in summer squash was reported earlier by Aruah *et al.,(*2010) ; Balkaya *et al.,* (2011), Aruah *et al.,* (2012) and Nouri Rad *et al.,(*2014) in melon.

The results of the correlation coefficient among some agronomic traits of summer squash studied during fall season 2015 are shown in Table (3),

Table 3. The correlation coefficients among some traits of genotypes of cucurbita in the 2015 fall planting season

	Plant height (cm)	Leaves /plant	Fresh weight /plant (gm)	Dry weight /plant (gm)	Male flowers /plant	Female flowers /plant	Sex ratio	No. of fruits /plant	Fruit weight (gm)	Yield /plant (kg)
Total yield (ton /hectare)	0.855**	0.832**	0.809**	0.672**	0.857**	0.881**	- 0.387*	0.908**	0.661**	0.991**
Yield /plant (kg)	0.856**	0.845**	0.799**	0.651**	0.846**	0.889**	- 0.387*	0.895**	0.692**	
Fruit weight (gm)	0.569**	0.539**	0.476**	0.381*	0.541**	0.530**	- 0.354*	0,445**		
No. of fruits /plant	0.834**	0.853**	0.819**	0.699**	0.874**	0.921**	- 0.351*			
Sex ratio	- 0.353*	- 0.427 **	- 0.351*	- 0.264	- 0.600**	- 0.339*				
Female flowers /plant	0.870 **	0.888**	0.841**	0.689**	- 0.757**					
Male flowers /plant	0.741**	0.803**	0.755**	0.604**						
Dry weight /plant (gm)	0.765**	0.741**	0.919**							
Fresh weight /plant (gm)	0.887**	0.825**								
Leaves /plant	0.894**									

*, ** significant at 1% and 5% Levels.

the total yield (tons /hectare) correlated positively and significantly with most traits except sex ratio was a correlation with negatively significant ($p< 0.01$). The yield per plant took the same result in correlation with most traits. A significant positive correlation was also obtained among fruit weight and, plant height, leaves number per plant, fresh and dry weight per plant, male and female flowers per plant, the number of fruits per plant. The number of fruits per plant takes the same results significant positive correlation with some traits under studied. There was a significant negative correlation between the sex ratio with a plant height of the plant, leaves number per plant, fresh and dry weight per plant, male flowers and female flowers per plant. Female flowers per plant gave a significant positive correlation with the plant height, leaves number, dry weight and fresh weight per plant, indication that both traits increase or decrease simultaneously and thus genotypes that produced higher number of female flowers per plant would as well produced a higher number of fruits per plant .However, dry weight had a significant correlation with most of the agronomic traits . The significant positive correlation obtained between yield per plant and number of fruits per plant indicated that yield per plant is increased with the increase in the number of fruits. These results agree with the findings of Bonilha *et al.,* 2009; Aruah *et al.,*2010; Abd El-hamed and Elwan , 2011; Yoldas ,2014; and Grisales *et al.,* 2015) .

REFERENCES

Abdullah AA, HH Hegazi, AA Ibrahim (2002). Evaluation of Locally-grown pumpkin genotypes in the central region of Saudi . J. King Saud Univ., Agric. Sci. Riyadh. 15(1): 13-24.

Abd El-hamed, K EL, MWM Elwan (2011). Dependence of pumpkin yield on plant density and variety . American Journal of Plant Sciences . 2:636-643.

Agbagwa IO, BC Ndukwu (2004). The value of morpho-anatomical features in the systematics of Cucurbita L. (Cucurbitaceae) species in Nigeria . Afri. J. Biotechnol., 3(10): 541- 546.

Al- Jibouri HA, PA Miller, HF Robinson (1958). Genetic and environmental variances and co-variances in an upland cotton cross of interspecific origin .Agron. A. , 50: 633- 636.

Aruah BC , MI Uguri, BC Oyiga (2010). Variations among some Nigirian cucurbita landraces. African Journal Scientia Biologicae , 3(2): 119-122.

Aruah BC, MI Uguru, BC Oyiga (2012). Genetic variability and inter- relationship among some Nigerian pumpkin accessions (Cucurbita app.). International Journal of plant Breeding. 6(1): 34-41.

Balkaya A, S Cankaya, M Ozbakir (2011). Use of canonical correlation analysis for determination of relationships between plant characters and yield components in winter squash (Cucurbita maxima Duch.). Bulgarian Journal of Agricultural Science, 17(5):606- 614.

Bonilha E, R Gioria, RF Kobori, PTD Vecchia, SMS Piodade, JAM Rezende (2009). Yield of varieties of Cucurbita pepo preimmunized with mild strains of papaya ringspot virus –type W and Zucchini yellow mosaic virus .Sci. Agric. , 66(3): 419- 424.

Burton GW (1952). Quantitative inheritance in grasses. Proc. Sixth Inti .Grassland Congress J. 277- 283.

Burton GW, EH Devane (1953). Estimate heritability in tall fescue (*Festuca orundinacea*) from replicated clonal material. Agronomy Journal 45:478- 481.

Espitia CM (2004). Estimacio'n y ana'lisis de parametros gene'ticos en cruzamiento diale'licos de zapallo Cucurbita moschata Dusch Exp Pior ., en el Valle del Cauca Tesis de Doctorado .Facultad de Ciencia Agropecaurias . Universidad Nacional de Colombia .Palmira .p.206.

Grisales SO, MPV Restrepo, FAV Cabrera, DB Garcia (2015). Genetic correlation and path analysis in Butternut squash Cucurbita moschata Duch .Rev. Fac. Nal. Agric. Medellin. 68(1): 7399- 7409.

Hazara A, S Fetahu, N Aliaga, I Rusinove, I Haziri, V Arapi (2007). Morphological and nutritive variation in a collection of Cucurbita pepo L. growing in Kosova .Natulae of Plant Science , 4(10): 374-386.

Kathiravan K, G Vengedesan, B Steinitz, HS Paris, V Gaba (2006). Adventitious regeneration in vitro occurs across a wide spectrum of squash (*Cucurbita pepo* L.) genotypes. Plant Cell Tissue Organic Cult., 85: 285-295.

Marie ABI, GH Mohammed (2010). Correlation, path coefficients and regression analysis in summer squash . Mesopotamia J. of Agric., 38(1):

Matlob AN, E Sultan, KS Abdul (1989). Vegetable Production .Part one and tow .Dar AL- kutab Puplication , Mosul , Iraq.

Mohammed BE, R Ehsan, A Amin (2011). Climatic suitability of growing summer squash (*Cucurbita pepo* L.) as a medicinal plant in Iran .Not Sci. Biol., 3(2): 39-46.

Precheur RJ, J Jasinski, RM Riedel, LH Rhodes, M Kelly, A Trierweiler (2007). Evaluation of pumpkin (Cucurbita pepo L.) varieties for resistance to powdery mildew .Podsphaera xanthi under a standard disease control program. Department of plant pathology. The Ohio State University , Colombus , OH 43210 online .

Refai EFS,MF Mohamed (2009). Population and single plant –derived inbred line analysis for sex expression in summer squash (*Cucurbita pepo* L.) CV. Eskandrani . Ass. Univ. Bull Environ. Res., 12(1) : 109-120.

SAS (2001). SAS/STAT ' User's Guide for personal Computer.Release , 6.12. SAS Institute Inc . Cary., U.S.A.

Tamil NA, P Jansirani, L Pugalendhi, A Nirmalakumari (2012). Performance of genotypes and correlation analysis in pumpkin (Cucurbita moschata duch. Ex poir) .Electronic Journal of Plant Breeding , 3(4) : 987-994.

Yoldas F,U Piskin, U Akdemir, A Askin (2000). Terms of kucuck menders a study on the determination of the appropriate type of squash .III .Vegetable Crops Symposium , 11-13September, Isparat, Turkey, 119-124.

Yoldas F (2014). Effect of plant variety and growing methods on yield and quality in summer squash. Fifth International Scientific Agricultural Symposium, Agrosym .p: 358-363.