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Study the Genetic Behavior in Some Okra Genotypes

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ABSTRACT

During the study that was conducted in the field of vegetable crop research of the Department of Horticulture and landscape design, College of Agriculture and Forestry, University of Mosul in the spring growing season 2018, to study the behaviour of ten genotypes of okra, under the conditions of the city of Mosul, Nineveh Governorate, the study was designed with three replications of the complete random block system. The genetic analysis of the genetic parameters of thirteen traits was conducted. The results showed that analyzing the sources of variance, the genotypes showed significant differences for all the traits studied under study, and the phenotypic and genotypic variation was high for, plant height, number of fresh fruits per plant, number of seeds per fruit and total seed yield per unit area, And the values of the phenotypic coefficient of variation were higher than the genetic variance factor for all traits. The heritability ratio in the broad sense was higher than 80% for the characteristics of plant height, number of branches per plant, number of fresh fruits per plant, the yield of marketing fruits and the length of fresh fruit, and length Fruit when seeds are extracted, and number of seeds per fruit. The total seed yield per unit area was positively correlated with the phenotypic and genetically significant characteristics of plant length, fruit length upon seed extraction, and the characteristic of the number of fresh fruits for each plant was positively correlated morphologically and genetically with both the number of seeds / plant and the length of the fruit when extracting the seeds and the length of the fruit Fresh.

Through the analysis of the path, there was a direct positive effect the characteristic of plant height, number of side branches and weight of 100 seeds on the total yield of seeds per unit area.

Keywords
Okra, heritability, seed yields, correlation, genotypic behaviour

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Introduction (Times New Roman, bold, 12)

Okra (*Abelmoschus esculentus L.*) is known by many local names in different parts of the world. It is called lady's finger in England, Gumbo in U.S.A. and Bhindi in India (Sing 2015) , in Iraq Bamyia , it is a warm-season annual herbaceous vegetable crop which can be found in nearly every market in Iraq. It is grown primarily for its young immature green fruits and fresh leaves used in salads, soups and stews. The crop which is generally self-pollinated (Martin, 1983), belongs to the Malvaceae (mallow) family (2n =130 chromosomes) and has its origin in West Africa (Joshi et al., 1974). Classified in the genus *Abelmoschus* (Olaniyi et. al., 2010) . Okra is one of the most popular vegetable crops grown throughout the tropics of the world during spring and summer seasons. It is valued for its edible green seed pods (Khandaker et al., 2017) . Okra requires a long warm and humid growing period. Okra is a good source of vitamins, minerals, calories, and amino acid found in seeds and compares favorably with those in poultry, eggs and soybean. The genetic variation can only be useful for crop improvement with the help of partitioning variances. Plant breeders are able to determine the relative importance of genetic and environmental variances. (Smriti and Ram, 2018) The mucilage found in okra may be used for

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plasma replacement or blood expender (Madison, 2008). Kummaret al., (1996) recorded significant different among five local genotypes of okra in number of branches per plant , number of fruits per plant, weight ,diameter and length in fruit and in total yield per area , correlation coefficient was observed between yield and stem length, number of fruit per plant and fruit weight . Parmer et al., (2012) recorded an increase in genetic yield potential gives a boost to okra production. Some biometrical techniques like variability, correlation and path analysis provide relative contribution of various yield related traits. Genotypic and phenotypic coefficients of variance suck out the association between yield and yield contributing traits in okra. If the association is positive and significant, simultaneous important and association is possible and significant. Path analysis split the correlation coefficient in to the measures of direct and indirect effect and determines direct and in direct contribution of various characters towards the yield. Kumar et. al., (2012) showed in their study The mean sum of square was highly significant for all traits, the phenotypic and phenotypic coefficient of variance were higher than their respective genotypic variance and genotypic coefficient of variance for all the traits, the PCV expressed inform of percentage were high for no. of fruits/plant followed by yield/plant, length of fruit, number of fruits/branch, diameter of fruit and plant height .Reddy et. al., (2012) recorded high magnitude of genotypic coefficient of variation for number of branches per plant, number of fruits per plant, marketable fruits per plant, total yield per plant. Singh and Goswami (2014) studied the correlation and path analysis of yield and yield contributing traits in 52 okra genotypes including PusaSawani and VRO-6 (National check) , the yield per plant exerted highly significant and negative association with length of inter node as well as positive association with number of fruit per plant, the path coefficient analysis revealed that height of plant, first fruiting node, length of fruit, width of fruit and number of fruits per plant at positive direct effect on yield per plant. Rajkumar and Sundaram (2015) recorded in their Study of thirty three diverse genotypes of okra revealed the presence of high variability, for primary branches at flowering, seed number and hundred seed weight. The traits viz., days to flowering, plant height, primary branches at flowering, fruit length , fruit weight, seed number and hundred seed weight were found to be highly heritable and hence, could be considered while selection. High heritability with high genetic gain observed for plant height, primary branches at flowering and inter node length indicate the predominance of additive genes, while high heritability with low genetic gain observed for days to flowering indicate the role of non-additive gene action. Many of research studied the genetic parameter in okra , they indicated that the genotypic and phenotypic coefficient of variability , heritability , and genetic advance were high for plant height, number of fruits per plant , fruit yield per plant , average fruit weight, fruit length, fruit diameter, number of seeds per fruit 100 seeds weight , fruit yield per hectare (Mehta et al.,2006 ; Reddy et al., 2012 ; Simon et. al., 2013 ; Mallesh et. al., 2015 ; Mulukenet al., 2016; Seth et al., 2016 ; Aminu et. al., 2016 ; Bello and Aminu , 2017 ; Singh , et. al., 2017 and Priyanka et. al., 2018) . Heritability is an index for calculating the relative influence of environment on expression of genotypes. It becomes very difficult to judge how much of the variability is heritable and how much is non heritable. Hence, it is essential to partition the overall variability into its heritable and non-heritable components with the help of genetic parameters like genotypic coefficient of variation, phenotypic coefficient of variation, heritability and genetic advance.

Objective of investigation to estimate genetic variability of yield and its components and find out the correlation among yield and its components at phenotypic and genotypic levels also to assess the path analysis among important yield contributing traits under the condition Ninevah government , Iraq .

Material and Methods

This experiment was carried out during spring season 2018 at the field vegetable experiments of department of horticulture and landscape design , college of agriculture and forestry , Mosul

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University to Study the Genetic Behaviour in Some Okra Genotypes under Mosul condition, Nineveh government , Iraq. The experiments materials consisted of genotypes of common bean (table 1).

Table 1. List of okra genotypes used in the experiment

S. No.	Genotype	Source
1	Samar	Argeto vegetable seed , turkey
2	Sultan	Argeto vegetable seed , turkey
3	Cleson spineless	Asgrow vegetable seed, U.S.A.
4	Kurdiya	Agra , Dohuk , Kurdistan region , Iraq
5	Kanikomany	Sarsenk , Dohuk ,Kurdistan region , Iraq .
6	Local (Mosuliya)	Rasheedia , Mosul, Ninevah , Iraq
7	Long ladies finger	Desi Seed Producer Company limited , lndia
8	Elephant tusk	Desi Seed Producer Company limited , lndia
9	Double color	Desi Seed Producer Company limited , lndia
10	Green star	Desi Seed Producer Company limited , lndia

The seeds of the genotypes were sowing at 28/ 3/ 2018 in rows of 2.5 m length and 70 cm with an approximate plant to plant distance of 30 cm (16 plants per plot). Using randomized complete block design (R.C.B.D.) with three replicate for each genotype possesses plots. All other necessary cultural such as fertilizing, weeding and cultivation were applied to all plots uniformly. The data were recorded for the traits. Vais : number of days for 50% flowering, plant height (cm) , number of branches per plant , number of fruits per plant , length and diameter of fruit (cm) , fruit weight (gm) , number of seeds per pod , length and diameter of seed (cm) , 1000 seeds weight (gm) , seeds weight per plats (gm) , seeds yield per plant (gm) and total seeds yield per hectares (ton). All the agronomic data were recorded and being subjected to analysis using the SAS statistical software (SAS, 2007). Genetic parameters were calculated genotypic (($\dot{O}^2$g) phenotypic ($\dot{O}$2p) variation from the table Anova according to the following: ($\dot{O}^2$g) = (Ms g –Ms e) / r, ($\dot{O}^2$p) = $\dot{O}^2$g + $\dot{O}^2$e.

Analysis of genetic coefficient variation (GCV) and phenotype coefficient variation (PCV) was according to Burton (1952), heritability values which the mentioned on Johnson *et al.* (1955) and Ali (1999) as follows:
$H^2_{b.s}$. < 40% low, $H^2_{b.s}$. 40-60 % medium and $H^2_{b.s}$. > 60 are high, the percentage of expected genetic advance from the mean (GAM) according to (Johnson *et al*., 1955), the expected genetic advance ratio reported by Robinson (1966). Phenotypic and genotypic correlation between seeds yield and yield related traits were estimated using the method described by Miller et al. (1958) .For the analysis of direct and indirect effects over seeds yield it was carried out path analysis among traits, with estimates obtained by means of regression equations, where traits are previously standardized, by using the method described by Crus (2013). Path coefficient analysis which refers to the direct and indirect effects of the yield attributing traits (independent character) on green pod yield (dependent character) was calculated following the method given by (Dewey and Lu 1959.The method according Dofing and Knight (1992) and Rodriguez et al., (2001) was used to find the direct effect of the traits under the study for seeds yield (kg/hectare .The limits of direct and indirect effects path coefficient analysis according to Link and Mishra (1973) are (0.0-0.09) cancel , (0.1- 0.19) low , (0.20 – 0.29) medium (0.3-0.99) high and more than 1 very high .

Results and Discussion

Figure 1 showing the type of the leave in the genotypes of okra which were sowing during spring growing season 2018 , it showed the shape was different in the type of leave in the figure.

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Figure 1. The type of the leaves in okra genotypes

Figure 2, showing the different in the shape, long, diameter and the colure in the fruit of the okra genotypes under the study.

Figure 2. The type of the okra fruits genotypes under the study

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Through the analysis of variance table (2) for the studied traits, it appears that there are significant differences for all the studied traits of okra varieties. This result is explained by the presence of genetic variances between the genotypes under study, and through these results it is possible to continue the analysis of the **components** of genetic variance, this result came With what each of (Kumaret al., 1999 ; Mehta *et al.*, 2006 ; Mehta *et al.*, 2007 and Reddy et al., 2012), for the characteristics of the number of days to bloom, the length of the plant, the number of fruits per plant, fruit yield and length, diameter and weight of the fruit, was consistent with each of (Osekita and Akniyele, 2008 and Sekyere et al., 2011) for flowering augmentation characteristic, the weight of 100 seeds and the total seed yield.

Table (3) shows the range, the general mean and genetic constants for ten genotypes of okra, as it is found that the range for the characteristic of the number of days to open the first flower was between 57.00 and 62.33, where the genotype (Samar) was early in that, and the genotype (Local mosuliya) gave the highest The height of the plant, and the number of branches per plant was high for the composition of genotype (Kanikomany). As for the characteristic of the number of consumable fruits only, the genotype (Elephant tusk) produced the highest number in that and the least number that came from the genotype (Samar).

It is evident from the same table that the genotype (Kanikomany) gave the highest marketing yield for a plant which was 2.09 kg / plant, and that the genotype produced the lowest marketing yield for this trait (1.03 kg / plant), while the highest fruit length was the genotype (Double color) and less. The length was for the genotype (KaniKomany). And that the highest diameter of the fruit was for the genotype (Green star) and the lowest diameter was for the genotype (Elephant tusk). The highest fruit weight was for genotype (local mosulyia). The highest number of ribs per fruit was for genotype (Green star).

As for the fruits at the seed production stage, it may appear from the same table that the genotype gave the highest fruit length at seed extraction, reaching 23.47 cm for the genotype (Elephant tusk). The highest number of seeds for each fruit was for genotype (Kanikomany) and the lowest number appeared in the genotype (Green star) as it was 100.67 and 53.67 seeds for each fruit, respectively. The highest weight of 100 seeds resulted in genotype (Long ladies finger). The highest total yield of seeds per unit area resulted from genotype (Clesonsprinless), reaching 1446.67 kg / hectare, and the lowest total yield resulting from the genotype (Kurdiya) as it reached 1023.33 kg / ha.These results explain that there are genotypes that differ among themselves in the characteristics of vegetative growth, yield and seed production, which explains the great genetic difference in the genotypes under study. This result was consistent with (Al-Mafraji, 2006 ;Hosamaniet al., 2008 ;Medagamet al., 2012 ; Kumar et al., 2012 ; Reddy 2012; Rajkumar and Sundaram 2015 ; Aminu et al., 2016 and Bello and Aminu 2017) to the presence of genetic variances in the early flower trait, plant height and number of The side branches of each plant, the fruit characteristics and the marketing quotient, in addition to the seed characteristics in terms of number of seeds per fruit, weight of 100 seeds, and total seed yield per unit area. Table (4) shows the genetic constants represented in all the phenotypic and genetic variation, the inheritance ratio in the broad sense, the coefficient of genetic and phenotypic variation, and the expected genetic improvement of the traits for ten genotypes of okra. Okra,It also appears that the heritability in the broad sense was high for the traits

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Table 2. Anova table for mean square for the traits for okra genotypes at growing season 2018 .

S.O.V	d.f	Mean Square												
Block	2	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Genotypes	9	4.133**	0.233**	0.079**	1920.700**	0.219**	0.065**	0.103**	1.066**	0.628**	1.231**	77.033**	0.286**	3134.433**
Error	18	10.311	1718.503	2.538	2980.033	0.344	43.310	0.151	2.870	4.805	50.023	574.518	6.604	38586.089
Total	29	0.800	28.048	0.176	165.922	0.010	0.743	0.074	1.141	0.434	0.337	18.551	0.105	4527.211

x1= No. of days for flowering , x2 =Plant length(cm) , x3=No. of branches/plant , x4=No. of marketable fruits/plant , x5= Marketable yield(kg) , x6= fruit length(cm) , x7=fruit diameter(cm) , X8 Fruit weight (g) , X9=No of ridges/fruit . x10=fruit length at seed extracted(cm) , x11=No. of seeds /fruit , x12= 100 seeds weight (g) , x13= total yield of seeds per hectares .

Table 3. The mean value for the traits for okra genotypes at growing season 2018.

Genotypes	The traits												
	X1	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
1	62.33 ab	116.67d	3.83e	119.33e	1.27cd	6.70d-f	2.20ab	10.59ab	6.77bc	9.10g	69.67c	5.17d	1266.00bc
2	61.67a-c	111.00d	4.17e	197.00a	1.68b	8.27cd	2.17ab	8.50c	7.70ab	15.50c	80.00b	5.03d	1303.67b
3	63.00a	144.33c	5.43bc	132.67de	1.13de	7.93cd	2.60a	8.63bc	6.80bc	14.97cd	60.67de	7.43b	1446.67a
4	58.33ef	137.00c	6.40a	148.33cd	1.36c	7.77c-e	2.23ab	9.42a-c	7.63ab	11.77f	82.00b	6.63c	1023.33d
5	59.33de	162.00b	6.50a	188.33ab	2.09a	5.6f	2.13ab	11.13a	8.50a	10.90 f	100.67a	8.57a	1182.00bc
6	60.67b-d	145.00c	4.93cd	190.67ab	1.72b	7.73c-e	2.37ab	7.98c	7.80ab	13.03e	85.00b	6.20c	1144.00c
7	57.00f	113.33d	6.03ab	177.33ab	1.61b	14.33b	2.17ab	9.05bc	5.50d	17.07b	80.33b	9.10a	1305.00b
8	60.33cd	109.00d	5.03cd	198.67a	1.92a	17.50a	1.93b	9.67a-c	5.87bc	23.47a	67.00cd	5.57d	1249.00bc
9	61.00bc	137.33c	5.10cd	170.33bc	1.56b	8.87c	2.13ab	9.16a-c	4.87d	14.10d	64.33cd	5.07d	1173.67c

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10	61.67a-c	181.67a	4.37de	120.33e	1.03e	6.23ef	2.67a	8.55 bc	8.57a	11.10f	53.67e	5.50d	1258.00bc

x1= No. of days for flowering , x2 =Plant length(cm) , x3=No. of branches/plant , x4=No. of marketable fruits/plant , x5= Marketable yield(kg) , x6= fruit length(cm) , x7=fruit diameter(cm) , X8 Fruit weight (g) , X9=No of ridges/fruit . x10=fruit length at seed extracted(cm) , x11=No.of seeds /fruit , x12= 100 seeds weight (g) , x13= total yield of seeds per hectares

Table 4. The genetic parameters in okra genotypes at growing season 2018 .

Genetic parameters	**Traits**												
	X1	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**	**X13**
Range	57.00 – 63.00	109.00-181.67	3.83-6.50	119.33-198.67	1.03-2.09	5.60-8.87	1.93-2.67	7.98-11.13	4.87-8.57	11.10-23.47	53.67-100.67	5.03-9.10	1023.33-1446.67
Mean	60.53	135.73	5.18	164.30	1.54	9.10	2.26	9.27	7.01	14.10	74.33	6.43	1235.13
$\sigma^2 p$	3.970	591.533	0.963	1103.959	0.122	14.932	0.099	1.717	1.891	16.899	203.874	2.271	15880.170
$\sigma^2 g$	3.170	563.485	0.787	938.037	0.111	14.189	0.026	0.576	1.457	16.562	185.322	2.166	11352.959
$\sigma^2 e$	0.800	28.048	0.176	165.922	0.010	0.743	0.074	1.141	0.434	0.337	18.552	0.105	4527.211
$H^2_{b.s}$	79.851	95.258	81.726	84.970	91.556	95.023	25.875	33.568	77.037	98.004	90.900	95.367	71.491
GCV	2.941	17.489	17.129	18.641	21.716	41.424	7.099	8.192	17.244	28.863	18.314	22.901	8.627
PCV	3.291	17.919	18.945	20.223	22.681	42.464	13.922	14.135	19.617	29.155	19.210	23.437	10.203
GA	327.764	4772.656	165.241	5815.816	65.777	756.413	16.812	90.611	218.243	829.935	2673.706	296.079	18558.750
GA % from mean	5.415	35.162	31.900	35.398	42.805	83.183	7.439	9.777	31.178	58.861	35.969	46.070	15.026

x1= No. of days for flowering , x2 =Plant length(cm) , x3=No. of branches/plant , x4=No. of marketable fruits/plant , x5= Marketable yield(kg) , x6= fruit length(cm) , x7=fruit diameter(cm) , X8 Fruit weight (g) , X9=No of ridges/fruit . x10=fruit length at seed extracted(cm) , x11=No. of seeds /fruit , x12= 100 seeds weight (g) , x13= total yield of seeds per hectares

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of most of the studied traits, as it exceeded 90% for the characteristics of the plant height and the marketing yield of fresh fruits, the length of the fresh fruit, the length
of the fruit when extracting the seeds, the number of seeds per fruit and the weight of 100 seeds, as it ranged between 70-85 % For the characteristics of the number of days of the emergence of the first flower, the number of side branches per plant, the marketing fruit yield of each plant, the number of ribs per fruit, the seed yield characteristic per unit area, and the heritability in a broad sense was low for the characteristics of the fruit diameter and the weight of the fruit. This result was in line with (Ahmad, 2002; Parmar *et al.* 2012 ; Reddy et al. 2012 ; Kumar et al. 2012; Muleken *et al*. 2016 ; Bello and Aminu 2017 and Priyanka et al., 2018) that the variance appears. The heritability rate was high for early flower characteristics, vegetative growth characteristics, fresh fruit yield, weight of 100 seeds, and seed yield per unit area. High values of heritability ratio in a broad sense indicate the influence of the non-additive to the genetic action.

During the same table also shows that the genetic variance coefficient was high for some of the studied traits, reaching 41,424 for the length of the fruit, followed by 28.863, 22.901, 21.716 and 18.641 for the characteristics of the length of the fruit when extracting the seeds, the weight of 100 seeds, the yield of the marketing fruits and the number of marketing fruits for each plant Respectively, and that the values of the phenotypic coefficient of variation were higher for the coefficient of genetic variation for all the studied traits, and the high values of the coefficient of genetic and phenotypic variance indicated the high variations between the genotypes that give an idea for the plant breeder to choose the traits and improve them through this study in the future. These results were in line with both (Simon et al., 2013; Malleshet al., 2015; Mulukenet al., 2016 and Bello and Aminu 2017).As for the genetic improvement of the studied traits of the genotypes in okra, it was high for most of the traits except for the SMP traits and the fruit diameter. These values indicate that the percentage of heritability in the broad sense is high enough to conduct selection to improve these traits in future generations for improvement in okra plant characteristics. The average values as a percentage of the expected genetic improvement were high for the characteristics of the length of the fruit (83,183) and the characteristic of the length of the fruit when extracting the seeds (58.861), followed by the weight of 100 seeds (46,070), the characteristic of the number of seeds per fruit (35,969) and the characteristic of the number of marketed fruits for each Plant (35,398).

The percentage of heritability, the expected genetic improvement and mean values as a percentage of the expected genetic improvement for these traits give an indication for the breeder to carry out the selection process to improve these traits, and these indicate variations in the genetic information that gives the high capacity for the selection process and this depends on the effect of the gene added to these traits in addition to The stability of the influence of environmental factors in order to improve the yield and productivity of okra. It is also possible that these high values are due to the dominant environmental influence of the expression of these traits, and these indicate the importance of the additional effect of the gene. This finding was consistent with both (Mallesh et al., 2015 and Bello and Aminu 2017).

Table (5) shows the phenotypic and genetic correlation between the trait pairs under study for the ten genotypes of okra. As it appears from the table that there is a positive

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Table 5. The phenotypic , genotypic , and environment coefficient correlation between the traits in okra genotypes .

Correlation	traits	X13	X12	X11	X10	X9	X8	X7	X6	X5	X4	X3	X2
rp	***X1***	0.367**	-0.570**	-0.524**	-0.170	0.077	-0.129	0.383**	-0.350**	-0.365**	-0.352**	-0.665**	0.149
rg	***X1***	0.565**	-0.651**	-0.590**	-0.184	0.192	-0.243*	0.539**	-0.413**	-0.477**	-0.434**	-0.769**	0.163
rp	***X2***	-0.158	0.125	-0.110	-0.536**	0.523**	-0.046	0.461**	-0.617**	-0.275*	-0.362**	0.176	1.000
rg	***X2***	-0.165	0.125	-0.081	-0.557**	0.657**	-0.085	0.993**	-0.652**	-0.296*	-0.392**	0.170	1.000
rp	***X3***	-0.282*	0.734**	0.487**	0.060	-0.050	0.134	-0.226*	0.090	0.287*	0.224*	1.000	
rg	***X3***	-0.379**	0.831**	0.578**	0.074	0.015	0.403**	-0.126	0.121	0.399**	0.273*	1.000	
rp	***X4***	-0.172	0.140	0.528**	0.538**	-0.128	-0.174	-0.454**	0.438**	0.858**	1.000		
rg	***X4***	-0.203*	0.141	0.617**	0.598**	-0.162	0.060	-0.941**	0.479**	0.929**	1.000		
rp	***X5***	-0.244*	0.253*	0.680**	0.380**	-0.065	0.306**	-0.492**	0.336**	1.000			
rg	***X5***	-0.299*	0.249*	0.751**	0.403**	-0.079	0.424**	-1.120**	0.357**	1.000			
rp	***X6***	0.129	0.091	-0.118	0.906**	-0.584**	-0.050	-0.323**	1.000				
rg	***X6***	0.190	0.111	-0.142	0.927**	-0.698**	-0.097	-0.835**	1.000				
rp	***X7***	0.145	-0.002	-0.252*	-0.320**	0.361**	-0.207*	1.000					
rg	***X7***	0.536**	0.055	-0.701**	-0.636**	0.609**	-1.002**	1.000					
rp	***X8***	-0.159	0.165	0.276*	-0.150	0.089	1.000						
rg	***X8***	-0.206*	0.296*	0.496**	-0.296*	-0.067	1.000						
rp	***X9***	-0.204*	0.022	0.295*	-0.481**	1.000							
rg	***X9***	-0.176	0.052	0.320**	-0.569**	1.000							
rp	***X10***	0.246*	0.008	-0.152	1.000								
rg	***X10***	0.297*	0.018	-0.169	1.000								
rp	***X11***	-0.342**	0.493**	1.000									
rg	***X11***	-0.498**	0.524**	1.000									
rp	***X12***	0.014											
rg	***X12***	0.012											

x1= No. of days for flowering , x2 =Plant length(cm) , x3=No. of branches/plant , x4=No. of marketable fruits/plant , x5= Marketable yield(kg) , x6= fruit length(cm) , x7=fruit diameter(cm) , X8 Fruit weight (g) , X9=No of ridges/fruit . x10=fruit length at seed extracted(cm) , x11=No. of seeds /fruit , x12= 100 seeds weight (g) , x13= total yield of seeds per hectares.

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phenotypic and genetically significant correlation for the characteristic of the number of days of flower emergence with each of the total seed yield per unit area and the diameter of the fruit and negatively with the characteristics of plant height and fruit length and with the product of marketing fruits for each plant and with the number of side branches for each Plant .The height of the plant was positively correlated, both phenotypic and genotypic, with the characteristics of the number of ribs for each fruit and with the diameter of the fruit. And negatively with the length of the fruit at seed extraction, the marketable yield, and the number of marketable fruits per plant. There was a positive significant phenotypic and genetics correlation between the characteristic of the number of lateral branches for each plant with characteristics of the weight of 100 seeds, the number of seeds per fruit, the marketing yield, and the number of marketable fruits per plant.

It also emerged from the table that there is a high positive phenotypic and genetics correlation between the characteristic of the number of marketed fruits for each plant with each of the number of seeds for each fruit, the length of the fruit when extracting the seeds, the length of the fresh fruit and the marketing yield of the fruits.

The marketing output trait was positively correlated with positive phenotypic and genetics with the characteristics of 100 seed weight, number of seeds per fruit, fruit weight and fruit length. Negatively with the attribute of total seed yield per unit of surveyor, and from the table we also find that there is a positive phenotypic and genetically significant correlation between each of the characteristic of fresh fruit length with fruit length when seeds are extracted, and negatively with the characteristic of the number of ribs per fruit and the diameter of the fruit. It also showed that there is a positive phenotypic and genetically significant correlation between the quality of the diameter of the fresh fruit and the number of ribs for each fruit, and a negative significant correlation with each number of seeds each fruit and the length of the fruit when extracting the seeds, and there is also a positive genetic and phenotypic correlation between the weight of the fruit with the number of seeds for each fruit.

There is also a positive phenotypic and genetically significant correlation between the characteristic of the number of ribs for each fruit with the attribute of the number of seeds for each fruit and negatively with the characteristic of the length of the fruit when extracting the seeds. Also there was a positive phenotypic and genetically significant correlation between the characteristic of the length of the fruit when extracting the seeds and the recipe for the total seed yield per unit area .And there is a positive phenotypic and genetically significant correlation between the characteristic of the number of seeds per fruit and the weight of 100 seeds.Through these results of the phenotypic and genetic correlations between trait pairs are important to determine the internal relationship, especially between when conducting selection processes to improve the morale of these productive traits for the marketing fruits and seed yield characteristics in the genotypes in okra. Many researchers have indicated the same results that we obtained in this study through the phenotypic and genetic correlations in okra (Rashwan 2011; Kumeret al. 2012 ; Simon et al., 2013 ; Ibrahim et al., 2013, and Aminu et al., 2016).

Table (6) shows the path coefficient analysis to study the direct and indirect effect of the most important characteristics of seed production, as it appears from the table that there is a direct positive effect for the yield characteristic of each of the plant height, the weight of 100 seeds, and the length of the fruit when extracting the seeds, and there is also an indirect significant effect of the

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characteristic. Related to seeds on the seed yield per unit area as it appeared, there are negative indirect effects for the characteristics of the number of seeds per fruit and the weight of 100 seeds on the plant's length and the number of side branches per plant. The trajectory analysis results for these traits were in line with (Rashwan 2011; Das et al., 2012 ; Celestin et al., 2012 ; Kumar et al., 2012 ;Ojoet al., 2012 and Sing 2015).

Table 6. The path coefficient analysis for the seeds traits in okra genotypes at growing season 2018.

Traits	S.W.	M.S.P	F.L.S.	Br.	PL.
PL.	0.00320676	-0.0020852	-0.0143088	0.0043835	0.02571
Br.	-0.9451873	-0.6578256	-0.0839402	-1.13799	-0.1940247
F.L.S.	0.00542647	-0.0523159	0.309	0.02279241	-0.1719725
N.S.P.	-0.2043215	-0.38994	0.06601967	-0.2254084	0.03162624
S.W.	1.15289	0.60409343	0.02024637	0.95756284	0.14379801
S. Y.	0.0120145	-0.4980733	0.29701704	-0.3786597	-0.1648629

PL.= Plant length, Br.= No. of branches /plant , F.L.S. =Fruit length at seed extraction, N.S.P= No of seed /fruit , S.W.= 100 seeds weight , S.Y.= Seeds yield /hectare.

Table 7. Showed some of morphological traits for ten okra genotypes under the study.

No.	Genotypes	Pod (Fruit) Color	Flower Color	Fruit Texture
1	Samar	light green	light red	Hispid
2	Sultan	light green	Dark red	Smooth
3	Cleson	light green	Creamy	Smooth
4	Kurdiya	Green	Creamy	Hirsute
5	Kanikomany	Green	light red	Hirsute
6	Cleson spinless	Light green to red	light red	Hispid
7	Long ladies finger	Dark green, blackish	light red	Smooth
8	Elephant tusk	light green	Creamy	Smooth
9	Double color	Red	Impregnated with dark red	Smooth
10	Green star	light green	Cream yellow	smooth

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