Ekoloji 28(107): 141-151 (2019)

Environmental Study of Genetic Behavior of Oil and Protein Ratio with Correlation Yield of *Zea maize* L

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Abstract

Crop yield is one of the complex characters controlled by several interacting genotypic and environmental factors. A field experiment is conducted at Babylon farm, Mashroo Al-Musaib, for five seasons (spring and autumn) 2014, 2015 and 2016. The study has some: to study the types of gene action, inheritance of important characters and to determine the combining ability in advanced generations of inbreads Zea maize. In the first season, diallel cross with one direction (half diallel) which was done among six genotypes of Zea maize: IK8, ZP, DK, M2, W17.161, IK58, and R153. The second season is a field experiment conducted for all crosses with parents using RCBD. Data is analyzed by Griffing method 2 fixed Model. Statistical analysis results reveal high significant differences among the genotypes in all studied characters. Variances values are estimated from additive and non-additive gene action, average degree of dominance and heritability in Zea maize and narrow sense. Genetic analysis shows that there is a significant difference for GCA and SCA for all the studied characters, indicating a predominance of non-additive gene action. The average degree of dominance is more than one for all the studied characters in all generations, which indicates the effects of over dominance. The estimation of heritability in Zea maize shows high values for most studied characters, while heritability in narrow sense has low values except grain yield per plant. Parent DK has the highest positive effect of general combining ability in the crosses (IK8XR153) in F1 in grain yield, oil and protein ratio. The expected genetic advance value increases with inbreeding advance. There is a positive effect of genotypic, environmental, phnotypic correlation for yield with protein and oil ratio for all generations under study. The highest hybrid vigor is noticed in zea maize because of the genetic diversity between genotypic. Yield gives the largest expected advance in F3 which is 1.73 with expected genetic percentage 7.74%. The main conclusions from these results, that is a continuous variance in genetic parameters, yield and its components for parents and these crosses in all the studied generations because the segregate generations and the characters are not well stabilized till F5 or F6, so these crosses must be grown to a successive generations to develop new genotypes with high oil, protein and yielding ability.

Keywords: Zea maize, griffing, protein and oil, genetic behavior, GCA and SCA, environmental factors

Al Nuaimi JJJ, Al Myali AAH, Hussein HT (2019) Environmental Study of Genetic Behavior of Oil and Protein Ratio with Correlation Yield of *Zea maize* L. Ekoloji 28(107): 141-151.

INTRODUCTION

Maize (Zea mays L.) is an important grain crop and ranks third after wheat and rice. It is used in human and animal nutrition, with a good proportion of oil in seeds ranging from (4-10%) and the increase of its production capacity and adaptation to different climatic conditions (Ahmed 2013). For the purpose of promoting this crop, breeders must be working to raise the efficiency of production through the creation of varieties and glamor characterized by high production capacity, and good quality specifications represented by the proportion of oil and protein. The hybridization process is an effective tool in the hands of plant breeders. It gives the potential to produce large genetic variation and allows for the selection of new genotypes. The aim of crosses between inbreeds is to combine desirable traits in a particular hybrid that can be directly used to produce other hybrids synthetic varieties. Half diallel crosses method proposed by Griffing (1956) is one of the hybridization methods among inbreds or varieties that determine the best inbreeds and genotypes used as parents and the best hybrids produced through it.

The research of plant breeders on new genotypic is an ongoing process that does not end. Due to the large and increasing genetic variation due to hybridization and genetic mutations in wheat and their complex inheritance because they contain more than one chromosome crew, there are great opportunities to develop new genetic structures with high environmental adaptation through Elected desired superior genes associated with the syndrome. The

 Received: 22 Aug 2017 / Accepted: 7 Nov 2018

usefulness of the estimates of correlability in assessing the number of promising breeds in the second and third generations is that they may assist in the selection of highly capable parents to ensure the continuity of high heterogeneity between the desired genes in later generations as well as the use of the genotype in the breeding program .It may help in the identification of susceptibility genealogical adaptability. If special correlationship is there, then camel breeding programs will be used and future selection of new and superior varieties will be developed if greater public cohesion is used among parents.

The success of camel breeding programs in the improvement of wheat bread requires knowledge of the genetic structure of quantitative traits that can be inherited and requires information on the inheritance of the grain yield and its physiological components and the nature of the relationship between the crop and its components. Understanding the genetic act that controls the components of the crop is an initial step in ensuring and successful breeding efforts. As a means to increase the productivity of wheat as a self-pollinating crop, it was found that there is a hybrid force that appears in the first generation and continues to be evident in later generations can be invested in the development of new varieties. Ahmed studied the characteristics of five pure strains of maize and their non-inverse reciprocal hybrids on a significant hybrid force calculated on the basis of the first generation deviations from the average of the parents of the grain characteristics, reached 80.615% which were higher than those of the parent and the general average. This is evidence of a hybrid force and of all traits (Abdel-Gawad 2003, Al. Enezi et al. 2018). Al-Dulaimi found that when one-way cross-fertilization among seven genetically modified maize structures was a positive hybrid (Dulaimi 2004, Şengüldür et al. 2018). The aim of this experiment is to identify the high hybrid hybrids that can be used in future maize breeding programs, and the extent to which they maintain their production characteristics in the second, third and fourth generations. It also aims to evaluate the heterogeneity of the hybrid structure and hybridization in important qualitative traits after determining the gene function which dominated their inheritance in later generations of cross-fertilization.

MATERIALS AND METHODS

The research was carried out in one of the fields of the Musaib project and five seasons (spring and autumn} for the years 2014, 2015 and 2016. Six genotypic sequenced genetically modified genotypes, (see **Table 1**), were used for cross-fertilization according to the second Griffing method. The subsequent seasons are chosen to obtain the first, second, third and fourth generations in order to obtain superior and stable genotypic in the ratio of oil and protein obtained after determining the type of dominant gene function in their inheritance. In the spring season 2016, two experiments were carried out, including the cultivation of the seeds of parents and the fourth generation, and the implementation of a cross-sectional RCBD field comparison experiment with three replicates, which included the planting of sixty-six genotypes, F1, F2, F3 F4, The distance between the plants and the lines 25 cm and each genetic structure planting lines with a length of 4 m. The process of harvesting after the arrival of plants stage three leaves so that one plant kept in the distance in the above. All soil and crop service operations were conducted for all seasons.

Table 1. Genetic structures used in cross - fertilization

Genotype	
P1IK8	Henkaria
P2ZP	Yugoslavian
P3DK	US
P4IK58	Henkaria
P5 W17.161	Local
P6R153	American

Studied Attributes

1- Protein ratio (%).

The ratio of the protein in the modified micro-chloride method (Association of official Agriculture Chemists 1980) was calculated by estimating the total nitrogen ratio and then multiplying it by 6.25.

2. Oil ratio (%): Obtained using the Soxulet device as described previously (AACC 1976).

3. Plant yield (g): By dividing the total of the ten plants on the number of plants (Williams and Hallauer 2000).

Statistical and Genetic Analysis

The data were analyzed for the studied traits according to the RCBD design. The average parenting and hybridization of the parents was tested using the least significant difference of LSD (0.05) (Steel and Torrie 1980).

Hybrid Vigor

Heterobeltosis of most traits was estimated as the mean of repeaters on the basis of the first generation deviation from the highest parents according to the following equation (Singh and Chaudhry 1985). Use the standard error SE to compare the hybrid strengths of the hybrid.

$$H\% = [(\bar{F}1 - \bar{H}P) / \bar{H}P] \times 100$$

Inbreeding

The ratio of internal education between the first and second generations and between the second, third and fourth generation was calculated according to the following equations (Sahuki 1990):

$$[(\bar{F}1 - \bar{F}2) / \bar{F}1] \times 100 = ID\%$$

$$ID\% = [(\bar{F}2 - \bar{F}3) / \bar{F}2] \times 10$$

$$ID\% = [(\bar{F}3 - \bar{F}4) / \bar{F}3] \times 10$$

Compatibility Analysis

General combning ability (G.C.A) and specific combning ability (S.C.A) was conducted in the case of significant differences between the genotypes (F1, parents), F2 (parents), F3 and F4 (parents), according to the second method of the Criffing analysis and using the fixed model (Griffing 1956). The standard error of the difference between the effect of general compatibility of parents and the standard error of the difference between the effect of the special compatibility of two hybrids was estimated to be shared with one parent as follows (Singh and Chaudhry 1985).

Determination of Gene Action and Genetic Parameters

Genetic gene variation (additive, dominance, and environmental) was estimated and narrow sense hertibility and the degree of dominance of each status (Singh and Chaudhry 1985).

Expected Genetic Improvement (ΔG)

The expected genetic improvement of traits was calculated by applying the following equation and four generations

$$\Delta G = h^2_{nsi}\sigma_p$$

As:

h_{nsi} = The intensity of the election and its value of 1.76 on the basis of the election of 10%

σ_p = Phenotypic deviation

The predicted genetic improvement was then calculated as a percentage of the arithmetic mean of each characteristic

As follows:

$$\Delta G\% = \frac{\Delta G}{\bar{y}} \times 100$$

Grwal and Ahmad (1982) suggest the limits of expected genetic improvement as follows (Agrwal and Ahmad 1982):

Less than 10% low and between 10% -30% medium and more than 30% high.

Phenotypic, Genotypic and Environmental Correlation

The phenotypic, genotypic and environmental correlation coefficients between the studied traits were estimated according to the following equations (Walter 1975):

$$r_P = \frac{\sigma_{P_X P_Y}}{\sqrt{\sigma^2{}_{P_X}.\sigma^2{}_{P_Y}}}$$

$$r_A = \frac{\sigma_{A_X A_Y}}{\sqrt{\sigma^2{}_{A_X}.\sigma^2{}_{A_Y}}}$$

$$r_E = \frac{\sigma_{E_X E_Y}}{\sqrt{\sigma^2{}_{E_X}.\ \sigma^2{}_{E_Y}}}$$

As:

$\sigma_{P_X P_Y}$ = Phenotypic contrast between x and y.

$\sigma_{A_X A_Y}$ = Additional Contrast variation between x and y.

$\sigma_{E_X E_Y}$ = Environmental Contrast between x and y.

RESULTS AND DISCUSSION

The results of **Table 2** indicate that there are significant differences between the genotypes in the ratio of oil percentage in all the studied generations, indicating the existence of genetic differences among them, noting that Father 2 P surpassed the rest of the parents and gave the highest rate of 6.30% .The lowest rate was given by Father 3 P and 6.09. Most of the responses gave a high rate in this class, and did not differ significantly in the first, second, third and fourth generations, except for the P1 x P4, which gave the highest rate of 7.46% 7.24% , 6.91, 6.85%, respectively. The lowest rate given by P2xP5 and P4xP6 in the fourth generation was 6.44% and did not differ significantly from the large number of resulting combinations.

All first-generation injections achieved a positive hybrid vigor compared with the highest parents. The highest P1xP4 was 27.21%. The parent 4 was given the highest rate of oil, indicating that the hybrid vigor was positively correlated with the high parental status of the p1xP6. The highest positive hybrid vigor was 9.36%.

Table 2. Ratio of oil% for parents and for the first, second, third and fourth generations and the percentage of hybrid strength of the first generation and the percentage of internal education

Inbreeding			Hybrid vigorF1	F1	F2	F3	F4	crosses	Grand mean	parent
F3 and F4	F2 and F3	F1 and F2								
6.60	13.78	0.42	14.44	7.21	7.18	6.81	6.63	P1xp2	6.15	P1
3.26	13.22	0.83	15.40	7.27	7.21	6.74	6.52	P1xP3	6.30	p2
4.79	4.97	0.70	27.21	7.19	7.14	6.91	6.58	P1xP4	6.09	p3
4.22	19.60	1.66	18.70	736	7.24	6.88	6.59	P1xP5	6.21	p4
5.16	5.57	0.55	18.20	7.30	7.26	6.97	6.61	P1xP6	6.20	p5
3.87	4.45	0.68	17.14	7.38	7.33	6.94	6.67	P2xP3	6-15	p6
0.86	1.41	3.04	18.40	7.46	7.24	6.91	6.85	P2xP4		
5.43	-1.47	-1.44	7.52	6.90	6.91	6.81	6.44	P2xP5		
2.21	-5.16	1.26	19.36	7.22	7.13	6.78	6.63	P2xP6		
0.52	-0.54	6.68	18.68	7.37	7.34	6.88	6.52	P3xP4		
1.18	-4.72	1.27	12.80	7.00	7.09	6.77	6.69	P3xP5		
1.78	-6.38	0.28	16.00	7.19	7.17	6.74	6.62	P3xP6		
0.39	-3.60	4.00	16.40	7.23	7.19	6.94	6.67	P4xP5		
0.53	-2.63	8.54	14.00	7.08	7.02	6.84	6.44	P4xP6		
3.57	-6.10	0.56	15.65	7.17	7.13	6.72	6.48	P5xP6		
				0.21	0.24	0.18	0.09			LSD
				Mean F1	Mean F2	Mean F3	Mean F4	Generation		
				7.22	6.80	7.17	6.62			
				0.40				LSD		

Table 3. Estimation of the effects of ii, iji, iji and their specific errors, and some genetic parameters of the oil percentage of parents and the first, second, third and fourth generations

Ĝi F1	Ĝi F2	Ĝi F3	Ĝi F4	Par.	Ŝij F1	Ŝij F2	Ŝij F3	Ŝij F4	Crosses
0.085	0.074	0.013	0.009	P1	0.279	0.267	0.124	0.113	P1xP2
0.087	0.075	0.015	0.062	P2	0.301	0.289	0.065	0.065	P1xP3
0.108	0.098	-0.005	-0.002	P3	0.252	0.240	0.200	0.099	P1xP4
0.091	0.080	0.038	0.020	P4	0.582	0.570	0.224	0.163	P1xP5
-0.163	-0.150	-0.030	-0.033	P5	0.621	0.609	0.315	0.207	P1xP6
-0.189	-0.177	-0.032	-0.055	P6	0.422	0.410	0.264	0.157	P2xP3
					0.350	0.339	0.088	0.168	P2xP4
0.038	0.040	0.031	0.025	SE	0.245	0.235	0.156	-0.035	P2xP5
					0.498	0.485	0.125	0.165	P2xP6
					0.430	0.417	0.174	0.054	P3xP4
					0.400	0.390	0.131	0.252	P3xP5
					0.509	0.496	0.111	0.207	P3xP6
					0.520	0.509	0.265	0.229	P4xP5
					0.410	0.359	0.168	0.029	P4xP6
					-0.654	-0.668	-0.242	-0.218	P5xP6
					0.095	0.098	0.077	0.061	SE

Dominance and hertibility		Variation							Mean sirqua			Gen.
h2N.S%	h2B.S%	Ā	σ2A	σ2D	σ2E	σ2gca/σ2sca	σ2sca	σ2gca	Ē	SCA	GCA	
3.165	90.243	7.417	0.002	0.052	0.006	0.018	0.052	0.001	0.006	0.058	0.013	**F4**
1.086	89.921	#NUM!	-0.001	0.082	0.009	-0.005	0.082	0.000	0.009	0.091	0.006	**F3**
5.648	97.028	5.688	0.029	0.462	0.015	0.031	0.014	0.462	0.015	0.477	0.129	**F2**
18.604	77.519	2.886	0.096	0.4000	0.020	0.082	0.036	0.438	0.009	0.429	0.127	**F1**

P2xP5 and p3xp5 gives the highest negative percentage of inbreeding between the first and second generations. All crossing giving positive inbreeding value except p2xp5, p3xp5 crosses was -0.14, - 1.22 respectively.

The results of **Table 3** show that there are significant differences between the genotypes in general and specific combining ability in all studied generations. The ratio of general combining ability to the specific combining ability was 0.082, 0.05, 0.031-, and 0.018 in the studied generations respectively, indicating a non-host effect of genes prominent in the inheritance of that characteristic. Parent P3 gave the highest positive effect of general combining ability in the first generation and the second was 0.108, 0.098 respectively, indicating its high ability to general harmony and giving a high oil

Table 4. Protein ratio of parents and the late generations and the percentage of hybrid strength of the first generation and the percentage of internal education of generations

Inbreeding			Hybrid vigorF1	F1	F2	F3	F4	crosses	Grand mean	parent
F3 and F4	**F2 and F3**	**F1 and F2**								
0.00	5.43	0.92	16.54	10.78	10.68	10.10	10.10	P1xP2	9.25	**p1**
-1.76	7.76	0.36	20.22	11.12	11.08	10.22	10.40	P1xP3	9.20	**p2**
0.40	6.03	1.20	15.60	10.75	10.62	9.98	9.94	P1xP4	9.13	**p3**
0.68	5.86	-1.96	15.67	10.70	10.91	10.27	10.23	P1xP5	9.30	**p4**
-3.10	8.09	0.45	18.05	10.92	10.87	9.99	10.30	P1xP6	9.23	**p5**
1.11	4.63	-1.12	16.00	10.67	10.79	10.20	10.20	P2xP3	9.17	**p6**
8.60	-3.52	1.09	18.17	10.99	10.78	11.16	10.20	P2xP4		
1.53	3.88	-1.88	14.84	10.60	10.83	10.41	10.25	P2xP5		
1.63	4.11	5.81	9.78	10.84	10.21	9.79	9.63	P2xP6		
1.55	3.92	2.37	17.85	10.96	10.70	10.28	10.12	P3xP4		
2.60	2.90	-2.89	12.45	10.38	10.68	10.37	10.10	P3xP5		
2.18	7.72	-0.28	18.64	10.88	10.91	10.11	10.33	P3xP6		
-1.69	6.84	-3.04	13.76	10.50	10.82	10.08	10.25	P4xP5		
0.20	4.42	2.35	14.51	10.65	10.40	9.94	9.92	P4xP6		
-1.17	4.93	1.20	17.77	10.87	10.74	10.21	10.33	P5xP6		
				0.118 0.122 0.052 0.076 0.025 SE						
Grand mean F1				Grand mean F2	Grand mean F3	Grand mean F4	Gen.			
10.85				10.70	10.20	10.15				
							n.s LSD0.05			

ratio with the parents that participated with the highest negative impact of the public uniformity towards the reduction of oil percentage% gave parents P 5and p6 in the first generation the highest negative effect of the overall coalition capacity was -0.163 And -0.189 respectively, thus demonstrating the weakness of their general consensus towards increasing that status. The highest positive effect of special combining ability was obtained from P1xP6, p4xp5, p3xp6 in the first generation of 0.62, 0.520, and 509.0 respectively, so it is preferred to be used in future breeding programs to improve this status in maize. The highest negative effect of the combining ability of the oil drop was caused by P5xP6 in the four generations of 0.654-668, 0.242, -0.218 0 sequentially. The dominance genetic variability of the four generations was 0.082 0.052, 0.462, 0.0400 respectively. The additive genetic variation was 0.096, 0.002 -0.001, 0.029, respectively, in the studied generations, which was reflected in the degree of dominance that is greater than one in the studied generations. There are odds of the non-additive effect of genes and the existence of epistasis-dominance. Estimates of the inheritance ratio in the broad sense gave values that culminated in the second generation. This represents the amount of genetic differences between genotypes. The high values of genetic variation led to a high inheritance rate in the broad sense. In this capacity, it is noted that environmental variability values are low, indicating that they are less affected by environmental factors. Estimates of the inheritance ratio in the narrow sense were 18.604% in the first generation, representing the participation of the host effect of the genes in showing that characteristic. The high inheritance ratio in the narrow sense to 18.604% in the first generation was associated with increased variability of the host gene to 0.096, causing a decline in the degree of sovereignty to 2,886 compared with the reduction of inheritance in the narrow sense in the third generation to 1.086% due to the low value of additive genetic variation There is no indication that additive genes have been eliminated in the direction of the low contribution of their effects to the inheritance of that trait. It is concluded from the data of this attribute that the proportion of inheritance in the narrow sense has increased in the first generation, so it is recommended to continue the internal education of this attribute to improve that capacity.

The results of the analysis of variance indicate that there is a significant difference between the genotypes in the percentage of protein in F1, F2 and F3 generations, indicating that there are genetic differences between them. It is clear from the data in **Table 4** that Father 4 P gave the highest rate of 9.30 g, which differed significantly from the rest of the parents, which gave different rates. The lowest rate of protein was obtained from father 3P and reached 9.13%.

P1xP3 in the first generation gave the highest protein rate of 11.12%. The lowest rate of P2x P6in the fourth generation was 9.23%. All first-generation combinations gave positive hybrid vigor compared to the highest parents. The highest ratio was P1xP3 19.36.

Table 5. Estimation of the effects of the general ii and ixi correlations, their variances, their errors, and some genetic parameters of the percentage of parents and the first, second, third and fourth generations

Ĝi F1	Ĝi F2	Ĝi F3	Ĝi F4	Par.	Ŝij F1	Ŝij F2	Ŝij F3	Ŝij F4	Crosses
0.076	0.080	-0.025	0.030	**P1**	0.362	0.335	0.180	-0.597	**P1xP2**
0.028	0.025	0.018	0.020	**P2**	0.549	0.559	0.226	-1.681	**P1xP3**
0.108	0.102	0.095	0.053	**P3**	0.215	0.187	0.062	-0.639	**P1xP4**
0.023	0.019	0.014	0.010	**P4**	0.632	0.560	0.325	-0.583	**P1xP5**
-0.067	-0.066	0.040	0.015	**P5**	0.687	0.709	0.251	-0.278	**P1xP6**
-0.176	-0.159	-0.359	-0.126	**P6**	0.428	0.424	0.161	0.833	**P2xP3**
					0.503	0.496	0.197	-0.569	**P2xP4**
0.050	0.049	0.040	0.044	**SE**	0.648	0.637	0.424	-0.736	**P2xP5**
					0.108	0.107	-0.014	0.125	**P2xP6**
					0.234	0.342	0.242	-1.097	**P3xP4**
					0.388	0.405	0.305	0.514	**P3xP5**
					0.754	0.731	0.231	1.708	**P3xP6**
					0.576	0.632	0.097	0.778	**P4xP5**
					0.465	0.403	0.245	0.972	**P4xP6**
					-0.564	-0.712	-0.359	-0.972	**P5xP6**
					0.048	0.064	0.052	0.350	SE

Dominance and hertibility			**Variation**						**Mean sirqua**			**Gen.**
h2N.S%	h2B.S%	Ā	σ^2A	σ^2D	σ^2E	σ^2gca/σ^2sca	σ^2sca	σ^2gca	Ē	SCA	GCA	
8.679	86.395	9.416	0.003	0.113	0.018	0.015	0.113	0.002	0.0182	0.131	0.0315	**F4**
5.991	89.965	5.270	0.009	0.125	0.015	0.036	0.125	0.004	0.0149	0.1403	0.0507	**F3**
1.963	96.594	9.907	0.013	0.638	0.023	0.010	0.638	0.007	0.0229	0.6611	0.0759	**F2**
18.822	92,731	8.010	0.083	0.338	0.033	0.012	0.648	0.008	0.0330	0.7612	0.0858	**F1**

Bactash *et al.* obtained a hybrid strength of 53% compared to the highest parent (Bictash and Wahib 2003). P3xP5 gave negative rate of inbreeding between the third and fourth generations, reaching -2.89%. P2xP4 gave the highest negative rate of inbreeding between the second and third generations, reaching -3.52%, while the third generation was 3.60% between the first and second generations, the P1xP6 was given the highest negative rate -3.10%.

The results of **Table 5** show significant differences in G.C.A and S.C.A in the percentage of protein in the studied generations, indicating the contribution of the host and non-host gene to the inheritance of this characteristic. The ratio of general permutability variance to the specific heterogeneity variability was 0.012, 0.010, 0.036 and 0.015 respectively and in successive generations indicating a greater contribution to the non-host effect of genes in showing this characteristic. Tawfiq (2004) found that the non-host effect was greater in the inheritance of this trait and also obtained the same result. The highest positive effect of G.C.A was achieved by decreasing the ratio of protein in P3 in the first, second and third generations to 0.108, 0.102 and 0.095, 0.053, respectively. The highest negative effect In the case of the decline in that capacity, in P 6, it was 1.176, -1.59, -0.35, 0.126, in the studied generations, respectively, indicating the weakness of G.C.A (Alvi et al. 2003).

The low values of the variance of the effect of G.C.A indicate the low contribution of parents to the inheritance of that attribute or that they have given similar rates of rise or fall in the combinations in which they participated. The highest positive effect on the increase of this characteristic was obtained from P3xP6 in the first, third and fourth generation of 0.754 and 0.731, 1.708, followed by the P5 x P4, first, third and fourth generation of 0.778 and 0.576. 0.632, respectively. These future education programs can be used to improve this trait. The highest negative effect of S.C.A was given by P1xP3 and p3xp4 in the fourth generation at -1.681 and -1.097 while the P5xP6 was negative in the four generations of -0.564, -0.712, -0.359 and 9.72 respectively.

The genetic variability was higher than the additive genetic variance and was 0.338, 0.638, 0.125, and 0.113 respectively in successive generations respectively. This was reflected in the control rate of 8,010 9.907, 5.270 and 9.416 respectively, showing the dominance of the non-host effect of genes, the heritability in the broad sense was 92.33, 96.59, 89.96, and 88.39 % respectively. The percentage of genetic differences between genotypes and high contribution to genetic variance and low environmental variability was estimated at 18.82, 1.96, 5.79, 8.70% in the studied generations respectively

This ratio represents the participation of the additive effect of the genes in showing that characteristic, and

Table 6. Average grain yield (g / plant) for parents, first, second, third and fourth generations

Inbreeding			Hybrid vigorF1	F1	F2	F3	F4	crosses	Grand mean	parent
F3 and F4	F2 and F3	F1 and F2								
6.80	7.14	12.4	93.10	244.93	214.43	199.12	185.59	P1xP2	120.35	p1
4.08	5.19	10.23	70.70	248.45	223.02	211.44	202.79	P1xP3	126.84	p2
7.90	4.88	5.23	30.12	232.53	220.36	209.61	192.98	P1xP4	145.25	p3
5.32	5.92	2.86	82.00	220.06	214.45	201.64	190.90	P1xP5	178.70	p4
8.88	10.73	8.85	17.00	263.80	290.45	214.63	195.57	P1xP6	121.20	p5
7.37	30.81	8.19	8.55	230.78	311.87	215.76	199.85	P2xP3	225.28	p6
9.33	7.06	9.52	42.56	254.76	230.51	214.23	194.24	P2xP4		
5.00-	17.39	8.44	107.00	251,09	229.89	189.91	199.38	P2xP5		
38.40	7.20	9.07	13.50	255.71	232.51	215.76	132.91	P2xP6		
9.97	0.18	9.07	32.80	237.34	215.80	211.03	190.00	P3xP4		
6.98	1.57	5.70	57.45	228.70	215.68	212.29	197.46	P3xP5		
0.39	9.65	17.38	19.01	268.64	228.86	206.63	205.82	P3xP6		
3.92	3.09	28.95	61.8	288,48	111.09	204.56	196.62	P4xP5		
36.27	22.44	0.01	19.60	269.95	369.92	209.35	133.41	P4xP6		
26.24-	77.58-	18.61	57.30-	143.12	116.48	206.85	135.37	P5xP6		
					9.024 18.148 3.657 1.956 SE					
			Grand meanF1 243.74	Grand meanF2 218.53	Grand mean F3 201.52	Grand mean F4 183.85	Gen.			
	15.037						.05 0LSD			

gave the first generation the highest proportion of inheritance in the narrow sense due to the low genetic variance in the additive and the increase in the genetic variance, which was reflected in the degree of Domin of 8.010 .As a result of genetic inheritance of the host genes in the first and second generation, this was reflected by the low value of host genetic variability. The inheritance ratio in the narrow sense decreased to 1.963 and the degree of Dominance increased to 9.907. It is concluded from the data of this attribute that the inheritance ratio in the narrow sense has increased in the fourth generation, so it is recommended to continue the internal education of this character of this generation to improve that character.

P3 gave the highest rate of grain yield of 225.28 g / plant and differed significantly from the rest of the parents who gave the lowest rate of P 1 reached 120.35 g / plant. The reason for the superiority of the P3 is due to its superiority in the components of the weight of the grain and the number of grains / cloves and the number of cloves / plant that has not been addressed in the research, especially if there is a positive significance correlation between the grain and these qualities. Twelve crosses were given high rates in this trait in the first generation. The highest was P3xP6 in the first generation, thirteen crosses gave in the first and second generation, the highest rates of the best p3xp6 was 369.90 g / p2xp6, which was 311.43 g / plant, and p1xp6, which was 290.45 g / While p4xp6 was the highest yield of 249.95 g in the first generation. P1xp3 gave the highest positive hybrid vigor to the highest fourth-generation parents at 52.570%contrasting mode is p4xp6% 51. P2xP6 was given the highest positive rate of inbreeding value between the first and second generation of 0.384% and the average grain yield g / plant was 132.91. To 215.76. In the first and second generations, the grain yield rate increased to 235.71 and 232.51 g / plant respectively, which resulted in a positive ratio of the second, third, third and fourth generations of inbreeding vale. **Table 6** shows that the grain yield is unstable between the three generations studied because the second and third generations of isolationist generations do not settle in these generations until the fifth or sixth generation and then determine the stable mixing product and can be called a inbreed line This is an excellent indicator of the non-dependence of offspring from maize and its designation as inbreed line or variety.

Table 6 shows that there are a significant differences between the genotypes in this trait in all studied generations.

It is clear from the results of **Table 7** that there is significant difference in the generality of the G,C,A in the studied generations, either the susceptibility of the S.C.A was high significance for the first and second generations of the third and insignificance of the fourth generation, indicating the participation of the host and non-host of genes in the presentation of this attribute. The ratio between the general permutation variance and the variability of the special correlations was less than 1, 0.012, -0.010, 0.019 and 0.012 in the studied generations respectively, indicating that the non-additive variation was the most prominent in the inheritance of that characteristic.

Table 7. Estimation of the effects of ii, iji, ijij, and some of the genetic parameters of plant yield / plant for parents and first, second, third and fourth generations

Ĝi F1	Ĝi F2	Ĝi F3	Ĝi F4	Par.	Ŝij F1	Ŝij F2	Ŝij F3	Ŝij F4	Crosses
0.876-	-1.330	1.770	0.402	P1	11.835	9.913	12.845	6.870	P1xP2
6.889	5.949	4.738	3.344	P2	26.622	21.569	24.688	24.189	P1xP3
9.754	2.883	5.216	3.220	P3	20.766	11.937	22.968	14.973	P1xP4
7.681	9.857	5.100	2.629	P4	21.033	21.273	31.023	21.985	P1xP5
-8.650	-5.389	-10.922	-6.462	P5	98.994	103.853	38.991	23.331	P1xP6
-6.678	-11.970	-5.902	-31.973	P6	86.093	103.148	26.043	18.316	P2xP3
					24.729	14.813	24.628	13.293	P2xP4
3.805	10.144	4.702	2.718	SE	26.376	29.438	16.326	27.528	P2xP5
					39.168	38.633	37.160	25.487	P2xP6
					10.952	3.167	20.950	9.180	P3xP4
					28.830	18.290	38.230	22.914	P3xP5
					57.566	38.053	27.549	22.403	P3xP6
					20.850	157.800	20.950	20.923	P4xP5
					32.687	18.548	30.610	31.354	P4xP6
					61.349	70.750	-41.349	-31.973	P5xP6
					18.952	25.201	2.932	1.094	SE

Dominance and heritability			Variation						Mean sirqua			Gen.
$h^2_{N.S}$%	$h^2_{B.S}$%	ā	σ^2A	σ^2D	σ^2E	σ^2gca/σ^2sca	σ^2sca	σ^2gca	Ē	SCA	GCA	
2.364	**99.070**	**9.045**	**29.202**	**11.490**	**1194.508**	**0.012**	**1194.508**	**14.601**	**11.489**	**1205.998**	**128.299**	**F4**
3.691	**98.499**	**7.167**	**84.566**	**2172.058**	**34.397**	**0.019**	**2172.058**	**42.283**	**34.397**	**2206.454 x**	**372.662 x**	**F3**
3.789	**85.389**	**#NUM!**	**120.990**	**5894.238**	**987.887**	**-0.010**	**5894.238**	**-60.495**	**987.886**	**6882.124 x**	**503.925 n.s**	**F2**
3.766	**87.389**	**#NUM!**	**1621.000**	**5600.000**	**999.134**	**-0.012**	**5764.222**	**-40.555**	**882.685**	**5892.184 x**	**478.923 n.s**	**F1**

The results of **Table 7** show that P4 and P P2 in the first and second generations gave the highest positive effect of G.C.A towards the increase of grain / plant yield of 5.949, 6.883, 9.857 and 7.981 respectively, indicating their high contribution to the inheritance of that characteristic with the parents who participated with the parents, while P6 gave poor performance in its general assembly by giving it the highest negative values for the effect of G.C.A in all studied generations indicating that it gave similar rates of rise or fall with the parents that participated with it symmetrically.

The highest positive effect of the S.C.A of P1xP6, P2xP3 and for all generations has been demonstrated, requiring focus and use in future breeding programs to improve grain yield in maize. The highest negative effect on the S.C.A of the grain decrease was given by P5xP6 in the fourth and third generation, and in the first and second generations it had a positive effect. Mathur and Bhatnagar obtained a diallel crosses of thirteen inbreed line of maizesignificanceS.CA in some hybrids for the grain yield of the plant (Mathur and Bhatnagar 2003).

The study showed that the effect of the added genes is important in inheriting the traits above. In another study by the researchers Goutam on six genotypes involved in the program of diallel crosses (Goutam 2003), and found that the effect of S.C.A and G.C.A capacities is significant to the status of grain in the plant. In Rezaei et al., who studied diallel crosses between ten inbreed line of maize, the effect of G.C.Ain the coalition was significant for most parents and for all studied traits (Rezaei et al. 2004). The effect of the S.C.A in the coalition was significant for some combinations and the studied traits. The grain yield was significant in 50% of hybrids and showed that the added effect of genes was more important than the non-added effect of all traits

It was found that the status of the plant stem is under the influence of non-added genes and is responsible for the transfer of the status from parents to offspring (Singh et al. 2017). The values of genetic variance were greater than the genetic variance values of host in all generations studied. It means that there is an odds of the non-genome of the inheritance of that trait, between al-Juhishi (Jahishi 2012), the inheritance ratio in the broad sense and the degree of dominance 96%, 9%, and 4.26 respectively of the plant / plant, indicating the dominance of supergenic genes in the inheritance of this class (Amari 2016).

The non-host variability was greater than the host variability and the environmental variance of the number of rows of cloves in maize. Estimates of the inheritance ratio in the broad sense were high in all

Table 8. Expected genetic improvement of GA for different traits in maize

F1		F2		F3		F4		Traits
Genetic improvement (%)	Expected genetic improvement	Genetic improvement (%)	Expected genetic improvement	Genetic improvement (%)	Expected genetic improvement	Genetic improvement (%)	Expected genetic improvement	
0.60	1.46	2.49	5.45	1.52	3.06	7.74	10.73	Plant yield (gm)
0.45	0.92	0.26	1.83	0.40	0.04	0.59	0.06	Protein ratio (%)
3.26	0.23	1.02	0.069	7.99	0.37	0.20	1.36	Oil Ratio (%)

Table 9. Genetic correlation coefficients between pairs of studied traits in maize

Oil Ratio (%)	**Plant yield (gm)**	**Oil Ratio (%)**	**Plant yield (gm)**	**Oil Ratio (%)**	**Plant yield (gm)**	**Oil Ratio (%)**	**Plant yield (gm)**	**Traits**
F1	**F1**	**F2**	**F2**	**F3**	**F3**	**F4**	**F4**	
****0.343-**	****0.354**	****0.321 -**	****0.283**	**0.344-	0.198	****0.402-**	**0.211**	Protein ratio (%)
	****0.401**		****0.365**		*0.337		****0.39**	Oil Ratio (%)

studied generations, indicating an increase in genetic variance values and a decrease in the values of environmental variation. A large proportion of genetic differences are genetic. The proportion of inheritance in the narrow sense is very small in the studied generations, which shows how weak the contribution of the host effect to genes in the inheritance of that attribute, and note that the proportion of inheritance in the narrow sense is increasing as the generations studied gradually reflected the rate of dominance degree, which was the largest one for all generations. Its agreed with Nataraj, Shahi, and Vandanav (2014) and Netravati et al. (2013).

It is concluded that the non-additive effect of the genes has a higher than one of dominance degree and that the proportion of inheritance in the narrow sense is still low in the three generations. Therefore, we recommend the trend toward hybridization in improving maize. The rate of inbreeding value was fluctuating in the four generations and the differentiation was p2xp6 The overall trend of genetic analysis was that the grain yield under the non-host effect of genes had the highest positive effect of the special correlation in P1xP6, P2xP3, and for all generations, which required focus and use in future breeding programs grain yield in maize. Noor et al. (Noor et al. 2013), when using several genotypes of maize, explained the role of additional gene influence in controlling the number of grade grains. Sarac and Nedelea (2013), when using the half diallel of six inbreed line of maize, indicated the importance of dominant genes in the inheritance of plant grain.

The plant status was positively and morally correlated with oil weighting for all studied generations, while the phenotypic correlation was positive for the third and fourth generation. The environmental correlation was negative for the third generation and was not significant for the remaining generations. The association was positively positive with the percentage of protein for the first and second generation. The phenotypic correlation was positively positive with the first generation. The ratio of the oil to the protein ratio was significantly correlated with all the studied generations. The phenotypic correlation was negative for the first and second generations. The environmental correlation was insignificant for all generations studied

The predicted genetic improvement values for the studied populations are shown in **Table 8**. It is clear that the predicted genetic improvement and genetic improvement values as a percentage increase positively with the inbreeding advance. The expected genetic improvement of the product and genetic improvement as a percentage in the first generation is 60 and 0.71, respectively. The predicted genetic improvement and genetic improvement percentages were 4.402 and 0.318 respectively. On the other hand, the predicted genetic improvement and genetic improvement values as a percentage to the average oil percentage status for the first generation were 22.037 and 3.052 respectively.

CONCLUSIONS AND RECOMMENDATIONS

According to the study the progress in breeding for yield and its contributing characters of any crop is polygenically controlled, environmentally influenced and determined by the magnitude and nature of their genetic variability.

1. The hybrid vigor of maize was high due to a large genetic gap between genotypes.

Table 10. Descriptive correlation coefficients between pairs of studied traits in maize

Oil Ratio (%) F1	Plant yield (gm) F1	Oil Ratio (%) F2	Plant yield (gm) F2	Oil Ratio (%) F3	Plant yield (gm) F3	Oil Ratio (%) F4	Plant yield (gm) F4	Traits
0.081	0.110-	**0.041**	**-0.160**	0.054	**0.291-	0.110-	0.053-	**Protein ratio (%)**
	0.002		**0.043-**		**0.283 -		0.135-	**Oil Ratio (%)**

Table 11. Correlation coefficients between pairs of studied traits in maize

Oil Ratio (%) F1	Plant yield (gm) F1	Oil Ratio (%) F2	Plant yield (gm) F2	Oil Ratio (%) 3F	Plant yield (gm) F3	Oil Ratio (%) F4	Plant yield (gm) F4	Traits
-0.272	****0.266**	**-0.280**	0.123	***-0,290**	0.093	*- 0.292	0.158	**Protein ratio (%)**
	0.403**		**0.322****		0.231		0.255	**Oil Ratio (%)**

2. It was expected that the first generation hybrids, which gave high S,C,A, behaved the same in later generations. However, the results showed that the S.C.A were not transmitted to subsequent generations but were subject to genetic isolation, making the dependence on the first generation values in the camel infiltration inconclusive.

3. Data on the ratio of oil and protein showed that inheritance in the narrow sense has decreased in the fourth generation, so it is recommended to continue the election for this attribute for the fifth and sixth generation to improve that capacity.

4. The status of the plant's product had a demonstrative association, genetically and environmentally positive and moral with the two classes of oil ratio and the proportion of protein for the four generations.

5. It is not possible to develop large-scale programs to cultivate crosses on the commercial level, although it is the non-host action of the genes that controlled most of the traits studied, because this requires sophisticated technologies and high costs. Most of the programs of production of corn crosses have stopped in most countries of the world.

   The first generation of inheritance in the narrow sense of the second generation of the protein and oil percentage was 8.67%, so the direct selection of this crosses is possible only from this generation and future generation.

6. The study concluded that the proportion of oil and protein has increased its proportions in later generations and the percentage of genetic improvement expected for the share is greater than the ratio of oil and yield in F4, reaching 1.36.10,73 respectively.

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