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Genetic Analysis for Quantitative Traits in Maize Using Generation Mean Analysis

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Abstract

The choice of breeding procedure depend on the type and relative amount of genetic components which control the traits to be selected. The objective of this study is determine some genetic parameters using generation mean analysis method, six generations (p_1,p_2 and F_1,F_2.BC_1,and BC_2)from crosses of maize (OH40X Un44052) and (IK8X HS).

The results showed significant differences among generations in plant height Number of Kernels row^{-1}, 300 .kernel Weight and grain yield. Most additive, dominance, additive ×additive× additive x dominance and dominance x dominance affect on the study traits, However, dominance values were more than additive values for all traits which justifies the production of hybrid varieties in maize .Broad sense heritability of all traits were higher than narrow sense in both crosses.

Keywords: quantities, maize, Dominance, Additive x additive.

Introduction:

Maize is a major cereal crops in Iraq and world, which ranks the third one surpassed only by wheat and rice. Is providing raw material for food industry and animal feed (17). Grain yield is the most important quantitative, and complex trait in maize, this means that yield expression is caused, not only by genetic factors. but also by environment and genotype x environments interaction effect. The knowledge about the nature of gene action allows maize breeder to optimize their breeding program (9). The choice of selection. Breeding procedures for genetic improvement of maize or any other crops depends largely on the knowledge of types of gene action for different characters in a materials and estimation the plant Generation mean analysis, this technique developed by Mather and Jinks (8) and also this technique is useful to determine gene effects for polygenic traits. Its greatest advantage to estimate the epistate gene effect such as additive x additive, additive x dominance and dominance x dominance interaction (14). For improving varieties, it needs the understanding of the genetic mechanisms governs yield and yield components (11), and (17). Many researchers indicated the role epistemic gene effect .for grain yield and some other agronomic traits (15, 7, 4 and11) .

Also the heterosis has important implications for both F_1 and for obtaining transgresses segregate in F_2 generation. Falconer (5) described the homozygosis increase by the selling generation, vigour and productiveness which reduces by 50%, due to inbreeding depression. The present study aimed to obtain useful information for

quantitative traits in maize using generation technique.

Materials and Methods

The field experiment was conducted at the Experimental

Farm College of Agriculture , Duhok university, during the spring and autumn season of 2014.The four parental lines Table (1) were inter crossed to produce the two F_1 crosses (Oh40x Un4452)and (IK8XHS). the autumn season 2014 F_1 plants in each self crossed were and back crossed to the two parents to obtain F_2, BC_1 and BC_2 generations, the six generation P_1, P_2, F_1, F_2, BC_1 and BC_2 of the two maize crosses were grown during spring season 2015 in Randomize Complete Block Design with three replications in rows with 3m long and 0.75 m apart with 0.25m between plants. The six generation of each cross were planted in 2rows for each of P_1, P_2 and 6 row for F_1, 16 row for F_2 and 12 rows for BC_1 and BC_2 .In each replicate 20 plant of P1, P2, 60plant for F_1, 120 plants for BC_1, BC2 and 160 plant for F_2 were selected randomly for recording data on four traits namely, plant height, No. of kernels row $^{-1}$,300-kerneal weight and grain yield for plant

Table1 .Name, origin and source of the inbred lines Symbol inbred line origin source

P_1	OH40	U.S.A
P_2	Un44052	Greece
P_3	IK8	IPA
P_4	HS	USA

Generation means analysis was performed for crossing using the genetic model described by Mather and Jink (8) and notation by (6) to study the six parameters model.

Results and Discussion

The results of analysis of variance and mean squares of the four traits of crosses and their generation were presented in Table 2. The results revealed that all generation within crosses had significant differences of all studied traits indicating the existence of genetic variation and possibility of selection for yield and yield components .This finding indicates that the further portion of genetic variance to its components and the comparisons between means are valid with respect to the traits under study .The development of any plant breeding program is depend on the existence of genetic variation (16, 13, 3 and 1). Mean values and –their standard errors the four traits of two crosses are presented in Table 3. The mean values of the four traits for F_1 generation were derived from the OH40 X Un44052 Cross and gave higher mean of mid parents and the values reached 193.02, 42.33, 88.44 and 196.69, while the mid parents scoring 169.18, 36.64, 79.35.and 144.73 respectively ,In the second $cross_1$,the F_1 and P_1 and P_2 gave the same results for $cross_1$. The mean values of F_2 generation gave lower values for the four traits comparing with back $cross_1$ and back $cross_2$ in both crosses ,as well as, the transgresses in the F_2 generation ,for all traits was also observed in F_2 generation .Similar results were previously reported by Al-Ahmad, (2) ; lqbal, (7) ; Shahrokhi *et. al.* (12). Results in Table(4). revaluated the value of genetic components of mean for four traits in $cross_1$ and $cross_2$, the results showed that the high value of genetic components was showed in dominance and additive× additive interaction in both crosses for plant height No. Kernels row^{-1}, 300 Kernel weight and grain yield $plant^{-1}$, indicating that additive and dominance effect were important in the in heritance of these traits and some value of additive x dominance (j) effect were either positive or negative, indicating that dominance was towards direction of increasing and decreasing the studied traits, respectively .The negative or positive signs for additive x dominance (j) effect depend on which parent is chosen.

The results in the same Table for $cross_1$ (0H40 X Un44052), and $cross_2$ (IK8x HS).

the results showed, the value of additive (d) were positive for all traits excepts for .No .of Kernels row^{-1} While the values of dominance (h)were positive for all studied traits, also the additive x additive (i) appeared positive value for all traits in both crosses and the maximum value was 136.56 for grain yield $plant^{-1}$ in $cross_1$ and 182.54 for 300−kernel weight in $cross_2$.For additive x dominance (j) the all values were positive for all traits except 300- kernels weight in two cross and grain yield plant $^{-1}$ in $cross_1$ and also the value for additive x dominance (j) were positive. The all values of this parameter were negative value except No .of kernels row^{-1} and grain yield $plant^{-1}$ in cross two. From the results of the same table, the value of dominance effect more than the additive effect for the most traits and followed by the additive x additive effect .These results are in a harmony with those obtained by Iqbal *et.al.*(7) and Shahrokhi *et.al.* (12) when study the six generation mean in maize. Also Table(5) showed some genetic parameters for four maize traits in $cross_1$ and $cross_2$ .For broad and narrow sense the results were indicated that the plant height, kernels no row^{-1} 300 kernel weight and grain yield had the highest broad – sense heritability (0.99, 0.98, 0.96 and 0,99) respectively ,while the narrow sense was low for the same traits in $cross_1$. The broad sense showed the highest values for plant height kernels No. row, 300 kernel weight and grain yield with values (0.88, 0.88, 0.99 and 0.99) respectively and all traits recoded low values for narrow sense .This again indicates the preponderance of dominance variance in governing these traits .

Table 2 Analysis of variance for studied traits of six generation for $cross_1$ and cross2

sov	df	Hybridization	MS OF Traits			
			Plant height cm	No. kernels row $^{-1}$	300. grain weight (g)	Grain yield plant^{-1} (g)
Replication	2	$Cross_1$	396.81	20.11	20.04	968.47
		$Cross_2$	742.36	230.19	46607.66	11354.3
Generation	5	$Cross_1$	31603.56**	3310.70**	16896.85**	206099.14**
		$Cross_2$	25445.28**	5735.25**	427306.70**	319373.05**
Experimental error	10	$Cross_1$	3891.77	66.45	5.45	2505.56
		$Cross_2$	390.04	225.02	31320.95	4487.34
Sampling error	1484	$Cross_1$	1265.94	20.57	-6.58	20652.54
		$Cross_2$	71.52	18.97	190.61	1371.33
Total	1501					

*,**significant at level 0.05 and 0.01, respectively

Table 3. Generation means and standard error (se)of four traits in two cross of corn in bread lines

Generation	Traits (Mean +_SE)			
	Plant height cm	NO. of Kernels row $^{-1}$	300-grain weigh(g)	Grain yield plant -1 (g)
	Cross$_1$(0H40 X Un44052)			
P_1	141.20 +_0.62	36.71 +_0.45	86.98 +_0.55	142.74 +_3.10
P_2	197.16 +_1.35	36.28 +_0.53	71.73 +_1.60	146.72 +_2.17
F_1	193.02 +_0.85	42.33 +_0.50	88.44 +_0.64	196.69 +_2.45
F_2	180.66 +_1.08	32.14 +_0.55	66.79 +_0.70	110.54 +_2.17
BC_1	183.29 +_1.04	38.21 +_0.62	72.21 +_0.80	140.54 +_2.68
BC_2	188.82 +_9.91	37.26 +_0.71	79.67 +_0.90	148.24 +_2.30

$Cross_2$ (Ik8 x HS)

P_1	138.46 +_1.25	34.73 +_0.39	73.18 +_0.60	123.43 +_1.20
P_2	181.35 +_1.31	32.13 +_0.43	67.43 +_0.93	136.00 +_1.81
F_1	190.29 +_0.59	44.98 +_0.26	84.93 +_0.77	222.90 +_2.06
F_2	176.22 +_1.02	30.58 +_0.37	67.30 +_1.10	115.37 +_3.68
BC_1	178.33 +_1.01	32.91 +_0.23	68.57 +_0.59	140.53 +_7.68
BC_2	181.08 +_0.49	34.18 +_0.36	57.30 +_0.30	142.92 +_1.24

Table 4. Estimation the values of genetic components of mean for four maize traits in cross$_1$ and cross$_2$

Traits	M	D	H	i	J	L	x^2
Cross$_1$ (OH40 x Un44052)							
Plant height cm	180.66	5.52	45.40	21.56	22.45	41.38	1.39 N.S
No. of kernels row^{-1}	32.14	_0.94	28.20	22.37	0.73	_15.65	1.03 N.S
300_kernel Weight (g)	66.79	7.45	45.68	36.59	_15.08	_4.77	4.0 N.S
Grain yield plant^{-1} (g)	110.24	7.70	188.56	136.59	_5.71	31.30	2.75 N.S
Cross$_2$ (IK8 x HS)							
Plant height cm	176.22	2.75	44.33	13.94	18.69	_32.37	0.98 N,S
No .of kernels row^{-1}	30.57	1.27	23.43	11.88	2.57	10.54	1.33 N.S
300_kernel weight (g)	67.30	88.73	196.99	182.54	_91.77	_323.40	3.0 N.S
Grain yield plant $^{-1}$ (g)	115.37	2.37	197.59	105.40	4.91	34.92	2.75 N.S

Mean (M), Additive (d), dominance (h), additive× Additive (I) additive x dominance (j), dominance x dominance (1)and x^2 (chi square), respectively .

Table 5. Estimation of some genetic parameters for four maize traits of $cross_1$ and $cross_2$.

Genetic parameters	hybridization	Traits			
		Plant height cm	No. kernels row^{-1}	300 kernel weight (g)	Grain yield $plant^{-1}$ (g)
h.b.s	$Cross_1$	0.99	0.98	0.96	0.99
	$Cross_2$	0.88	0.88	0.99	0.99
h.n.s	$Cross_1$	_0.016	_0.007	_0.007	_0.93
	$Cross_2$	0.025	0.84	_0.01	_1.70
Heterosis	$Cross_1$	23.84	5.83	9.08	51.96
	$Cross_2$	30.38	11.54	14.45	92.18
In breeding depression	$Cross_1$	12.36	10.19	21.65	6.45
	$Cross_2$	14.07	14.07	17.63	10.75

$Cross_1$ (OH40 x Un44052), $cross_2$ (IK8 x Hs)

For the heterosis, the plant height and grain yield recorded positive heterosis and the value were 23.84 and 51.96, respectively in $cross_1$ while in the $cross_2$ the same traits had the highest positive heterosis with value 30.38 and 92.18 .These results obviously showed that the breeding methods based on hybridization will result in the improved these traits .

Conclusion

In this study traits ,the dominance values was more than the additive value .Thus the hybridization would be more effective than the two population under study and it was noticed that dominance effect had a considerable role in controlling plant height NO. Kernels row $-^{1}$,300- kernel weight and grain yield .so that it can be utilization of this type of gene action together with dominance gene effect in hybrid breeding

References

1. Akar. M, M; F.M. Saleem; MY. Azhar , Asharf and Ahmed R .,2008 .Combining abibility analysis in maize under normal and high temperature conditions. Journal of Agricultural Research, 46 (1) : 27-28.
2. Al-Ahmad ,A.S.2004. Genetic parameters for yield and its components in some new yellow maize es Phcross.D. Thesis, Fac. of Agriculture .Ainshams University ., Egypt.
3. Alam. AKMN,S .Ahmed ,M .Begum , and Sultan M.k..,2008.Heterosis and combining ability for grain yield and its contributing characters in maize . Bany ladesh Journal of Agricultural Research, 33 (3): 375-379
4. EI-Badawy, 2012.Estimation of genetic parameter in maize crosses for yield and its attributes ,Asian J. Crop Sci., 4(4): 127- 138
5. Falconer, D. S. 1989. Introduction to Quantitative Genetic. longman Scientific AND Techical , UK

6. Hayman, B.I. 1958. The separation of epistasis from additive dominance variation in generation mean. Heredity, 12: 371-390.
7. lqbal, M ; k. Khan; H. Rahman and Sher H. .,2010.Detection of epistasis for plant height and leaf area per plant in maize (*Zea mays* L .)from generation means Analysis .Maydica ,55 33-39
8. Mather ,K and J Jinks., 1982. Biometerical genetics.3rd edition . Chapman and Hall, London. England.

England p.396.

9. Melchinger , A. E, H. H. geiger and.Schnell F.W.1986 Epistasis in maize (*Zea mays* L.) Genetic effects in crosses amony early Flint and dent in bred lines determing by three methods. Theor. Appl. .Gen., 72; 231-239
10. 10. Milns . E.A and R.F .line .1986 Number of genes controlling high temperature aduit Plant resistance to stripe rust in wheat. phytopathology. 78.93-96.
11. Saleem, M. K. shahzad; M. Javed and Ahmed A. ., 2002. Genetic analysis for various quantitative traits in maize (*Zea Mays L.*) inbred lines .International Journal of Agricultural Biology, 4:379-382
12. Shahrokhi. M, S.K. khorasani and Ebrahimi A., 2013. Study of genetic components in various maize (*Zea mays L.*) trait, using generation mean analysis method International Journal Agron .plant Prod ., 4 (3): 405-412.
13. Singh P.K, and A. K. .Roy. 2007 .Diallel analysis of inbred lines in maize (*Zea mays L.*) International Journal of Agricultural Science, 3 : 213 -216.
14. Singh, R, P. and Singh S. .1992. Estimation of genetic parameters through generation mean analysis in

bread wheat. Indian J . Genet. plant Breed. 52:369-375.

15. Sofi, P; a. G. Rather and Venkatesh S.. 2006. Detection of epistasis by generation means analysis in maize hybrids. Pak .J.of Bio. Sci., 9 (10): 1983-
16. Srdic . J; Z. Pajic and Driniess . Maldenovic ., 2007 .Inheritance of maize grain yield components . Maydica, 52 (3): 261-264.
17. Unay. A, H. Basal and . konak C., 2004. Inheritance of grain yield in a half – Diallel maize population Turk. J. Agric., 28: 234-244 .

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التحليل الوراثي للصفات الكمية في الذره الصفراء باستخدام تحليل متوسطات الاجيال

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المستخلص

ان اختيار طريقة التربية تعتمد على نوع وعلاقة المكونات الوراثية التي تسيطر على الصفات المستخدمة في عملية الانتخاب أن هدف هذه الدراسة لتحديد بعض المعالم الوراثية باستخدام تحليل متوسطات الاجيال الستة (الاب الاول والاب الثاني وجيل الاول والثاني والتهجين الرجعي الاول والثاني) للتهجينين (OH40XUn4052), (k8xHS). أظهرت النتائج وجود اختلافات معنوية بين الاجيال للصفات ارتفاع النبات وعدد البذور في الصف ووزن 300 حبة وحاصل النبات كما لوحظ وجود التأثير السيادي والمضيف في المضيف والمضيف في السيادي والسيادي في السيادي وكانت قيم التأثير السيادي اكبر من قيم التأثير المضيف لجميع الصفات الذي له دور مهم في انتاج هجين الذره الصفراء وكما كان التوريث بالمعنى الواسع وفي كلا التهجينين ولجميع الصفات اعلى من نسبة التوريث بالمعنى الضيق.

كلمات مفتاحية: كمي.ذرة صفراء. سيادي ، مضيف في مضيف.