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ESTIMATION OF SOME GENETIC PARAMETERS, CORRELATION AND HERITABILITY IN VARIOUS MAIZE TRAITS

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ABSTRACT:
The study was carried out using ten maize hybrids in spring 2015 and 2016 were planted at field of Agriculture College, University of Duhok. All treatments arranged in Randomized Complete Block Design (RCBD) with three replications to determine the heritability, genetic advance, correlation and genetic parameters govering the inheritance of grain yield and related agronomic traits. The result showed significant difference among hybrids for studied traits in spring 2015 and 2016 and also the results revealed that hybrids and seasons interaction had significant difference for all traits. The season's spring 2015 was superior than spring 2016 in leaf area, days to 75% tasseling and silking, yield and its components. The hybrid (OH40 xIK8) was superior in No. of rows ear^{-1}, No. of kernels row$^{-1,}$300 kernel weight and kernel yield plant^{1}. All studied traits recorded higher value of heritability, high genetic advance coupled with heritability was observed in leaf area and kernel yield plant^{-1}, thus selection based on these traits will be effective in maize breeding program. Grain yield was positively correlated with leaf area and 300 kernel weight, also No. of row ear^{-1} exhibited positive correlation coefficient with leaf area, 300-kernell weight and kernel yield plant^{-1}.

KEYWORDS: Genetic Parameters, Heritability, Maize Traits, Correlation.

1. INTRODUCTION

Maize (*Zea mays* L.)is the third most important cereal food crop of the word after wheat and rice. It is one of the most popular food, feed and industrial crop among all the cereals in present word, and wider adaptability to different environment. Plant breeder are interested in developing cultivars with improved yield and other desirable agronomic traits. Grain yield in maize and other crops are quantitative in nature and polygenic ally controlled but indirect selection for other yield related traits, which are closely associated with yield and high heritability estimate will be more effective.

The selection criteria may be yield or one or more of the yield component traits. However breeding for high yield crops requires information on nature and magnitude of variation in the variable materials, relationship of yield with other agronomic traits and the degree of environmental influence on the expression of these component traits.

Selection program depends not only on heritability of desirable traits but also on the information on association among various yield components traits and their association with grain yield. Several researchers (Mohan *etal*.,2002, Sigh *etal*., 2003 ,Ali *etal*., Emer.I, 2010; Kusaksiz and Refiq *eta.l*, 2010., Bello *etal*., Ram Reddyetal., Kumar and Kumar,2012; Khodadad *etal*.,2013; and Zohra *etal*.,2013; Aminu *etal*., 2014) reported about genetic variance ,heritability, correlation, path analysis and indicated that correlation coefficient analysis help researchers to distinguish significant relationships between traits, correlation coefficient analysis can assist to determine certain traits to be used in the improvement of the complex traits as yield.

The main objective of the study is to estimate the genetic variation, heritability, correlation for some agronomic traits and yield of 10 F1 hybrids maize.

2. MATERIALS AND METHODS

The experimental F1 was conducted at the field of College of Agriculture, Duhok University during the spring 2015 and 2016. Ten F1 hybrids (Table 1) were studied in Randomize Block Design with three replications. Each hybrid was planted in one row with 3 m long and 0.75m between the rows and 0.20m within the rows. Field was fertilized with (N.P.K., 27:27:0) at rate of 400kg/ha. As first doses, at planting date and 200 kg./ha of urea(46%) were added weed control and other cultivation practices were performed according to plant requirements .The data were recorded from 5 guarded plants chosen at random from each row for the following traits: grain yield plant^{-1}, Tasseling and silking , plant height cm, ear height cm, leaf area cm^{2}, number of rows ear $^{-1}$, number of kernel row^{-1} and 300-kernel weight (g). The means of row observed and five plants of each hybrids in each replicate were used for statistical analysis. The analysis of variance, correlation, heritability and genetic advance were calculated manually for all pairs of traits.

2.1 Statistical analysis

2.1.1 Phenotypic and Genotypic correlation: Phenotypic and genotypic were calculated for the traits by working out the variance components of each trait and the covariance components for each pair of traits using the formula of Robinson and Comstock, 1955, genotypic coefficient variation.

(Gcv) = $\frac{r\sigma 2g}{G.mean} x100$

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Genotypic variance $(\sigma_g^2) = \frac{Msg-Mse}{r}$

Msg and Mse = genotype and error mean sum of square and r = Number of replication.

Phenotypic variance $\sigma^2\text{pH} = \sigma^2 g + \sigma^2 e$

Environmental variance $(\sigma^2 e) = \text{MSe}$

Phenotypic coefficient of variation $(pcy) = \frac{\sigma^2 pH}{\sigma.mean} \times 100$

Where σ^2g and σ^2pH are genotypic and phenotypic standard deviation (variance), respectively to test the significant of correlation coefficient, the estimated values were compared with the table values of correlation coefficients of Steel,R.G.D and J.H.Torrie (1980) at 5% of significant with (n-2) degree of free town where (n) is the number of genotypes used in the experiment.

2.1.2 Heritability: Heritability in brood sense

$$\text{h.b.s} = \frac{\acute{o}^2 g}{\acute{o}^2 pH} \times 100$$

$$GA = K \times \sigma 2p \times Hb$$

$$GAM\% = \frac{GA}{Gmean} x\, 100$$

Where, K= the standard selection differential at 5% Selection intensity (2.063), GA=genetic advance, σ^2g, σ^2p, σ^2e and GA are genotypic, phenotypic and environmental components of variance and genetic advance, respectively under selection, K is selection differential, σpH is the phenotypic standard deviation of base population and H is the heritability of trait under selection.

3. RESULTS AND DISCUSSION

Results of the ANOVA table showed significant difference in the performance of the hybrids for all the studied traits in both season, spring 2015 and 2016 table (1). Combined statistical analysis of the data were presented in table (2) The results, revealed that hybrids and seasons had significant difference for plant height, ear height, Leaf area, days to 75% tasseling and silking, yield and yield components, as well there were a significant difference due to the effects of the interaction between hybrids and seasons in all studied traits . Regarding between the interaction between hybrids and season, the results in the same table showed significant difference effect on all studied traits.

Table 1. Mean squares of variance analysis of various maize traits in spring 2015 and 20016

Spring 2015										
		MS								
S.O.V	df	Plant height cm	Ear height cm	Leaf area cm^2	Days to 75% Tasseling	Days to 75% Silking	No. of rows ear^{-1}	No. kernels. Row^{-1}	300-kernel weight(g)	Kernel yield $plant^{-1}$ (g)
Block	2	40.30	96.70	157.0	0.43	0.833	1.97	1.43	11.18	24.8
Hybrids	9	942.68**	421.72**	15241**	22.83**	22.52**	8.74**	39.98**	295.63**	3818.3**
Error	18	63.67	32.66	228	0.61	0.61	0.500	1.08	2.73	15.829.23
Spring 2016										
Block	2	9.23	12.13	2859.0	7.23	3.70	0.93	7.3	9.92	
Hybrids	9	794.77**	557.54**	13131.0**	77.66**	78.86**	3.20*	65.29**	191.51**	
Error	18	34.75	12.21	2956.0	2.30	1.70	0.93	5.11	3.26	

(*), (**): Significant difference at 0.05 and 0.01 probability level.

Table 2.Mean square of combined analysis for Various maize traits in spring 2015 and 2016

s.o.v	df	Ms								
		traits								
		Plant height cm	Ear height cm	Leaf area cm^2	Days to 75% tasseling	Days to 75% Silking	No. of rows ear^{-1}	No.of Kernels row^{-1}	300-kernel weight(g)	Kernel yield $plant^{-1}$ (g)
Blocks	2	43.52	23.12	1018	2.11	1.51	2.80	3.61	2.80	42.20
Hybrids(H)	9	611.16	327.34**	3371**	46.08**	48.70**	3.95**	39.92**	274.65**	3343.20**
Season(S)	1	74.82	17.07	229959**	390.15**	534.01**	42.50**	40.01**	4675.66**	40000.30**
HxS	9	1126.30**	651.42**	15001**	54.4**	53.68**	7.98**	65.35**	212.50**	21276.4**
Error	38	46.94	25.77	1613	1.67	1.20	0.96	3.98	10.09	54.70
Total	59									

The average performance of hybrids in both season are presented in table (3). For plant height the hybrid (Un44052 x Ik58) exceeded all other hybrids and the value reached 210.0 cm, followed by hybrids (Un44052 x Ddhiq445) and (Hs x Ddhiq445). The lowest value for plant height was recorded by hybrid (OH40 x Ik8) with value of 177.0. The results in the same table, the hybrid (HS x Ddhiq445) was exhibited maximum ear height value of 105.3 cm where ever, the lowest ear height value for hybrid (Ddhiq445 x Ik8) was 77.5 cm. According to the effect of hybrids on leaf area, the maximum values recorded for hybrid (Un44052 x Ik58) with value of 663.1 cm^2. And hybrid (IK58 x 04HO) with value of 645.8 cm^2 while, the lowest leaf area exhibited by hybrid (Un44052 x IK8) which was 494.2cm^2. In the same table, its appear that hybrid (IK8 x HS) was earlier for day to 75% tasseling and silking which tasseled and silked in 76.0 and 78 days, while late tasseling and silking were recorded by hybrid (Ddhiq445 x IK8) that were 83.7 and 86.8 days respectively. For the traits No. of rows ear^{-1}, No. of kernels row^{-1} ,300-kernel weight and kernel yield $plant^{-1}$,the hybrid (OH40 x IK8) recorded the highest value for these traits and scored 17.7 , 42.5, 86.0 and 191.2 respectively ,while the lowest values for the same traits was recorded by the hybrid (Un44052 x HS) and that were for No. of row ear^{-1}16.0, the hybrid (Ddhiq 445 x IK8) for 300-kernel weight (63.1 g) and hybrid (Ddhiq 445 x Ik58)for kernel yield plant $^{-1}$ with value of (133.3 g). From the above observation, its appear that the hybrid (OH 40 x Ik8) was superior in kernel yield plant^{-1} and its components and the components of yield were more affected by the type of hybrids. This finding was in agreement with results of Hallauer and Scobs, 1973; Grzesiak, 2001; Danaie, 2007 who reported that hybrids significantly on yield and yield components of maize.

Table 3. Mean hybrids for various maize traits.

Hybrids	Traits								
	Plant height (cm)	Ear height (cm)	Leaf area (cm^2)	Days to 75% Tasseling	Days to 75% Silking	No. of rows ear^{-1}	No.of kernels row^{-1}	300-kernel weight (g)	Kernel yield plant^{-1}(g)
IK8 * HS	192.5^{bc}	95.8^{abc}	603.0^{ab}	76.0^{d}	78.5^{e}	16.7^{ab}	36.7^{bc}	62.7^{d}	116.2^{d}
OH40 * IK8	178.3^{de}	95.0^{bc}	618.0^{ab}	83.2^{a}	85.3^{ab}	17.7^{a}	42.5	86.0^{a}	191.2^{a}
IK58 * 04HO	177. 0^{e}	101.2^{ab}	645.8^{a}	80.5^{bc}	83.3^{bc}	17.7^{a}	41.0^{a}	72.9^{b}	158.2^{b}
HS * Ddhi9445	196.8^{ab}	105.3^{a}	562.2^{bc}	77.5^{d}	80.8^{d}	16.3^{ab}	35.7^{c}	64.8^{cd}	122.0^{ed}
Ddhi9445 * IK58	182.2^{cdc}	95.0^{bc}	627.6^{ab}	78.2^{cd}	81.3^{cd}	16.7^{ab}	35.2^{c}	71.5^{b}	133.3^{c}
Ddhi9445 * IK8	191.7^{bc}	77.5^{d}	615.6^{ab}	83.7^{a}	86.8^{a}	15.0^{b}	39.8^{ab}	63.1^{d}	124.8^{cd}
Un 44052 * Hs	189.2^{bcde}	94.2^{bc}	593.0^{abc}	82.2^{ab}	85.5^{a}	16.0^{ab}	42.6^{a}	70.8^{bc}	151.9^{b}
Un 44052 * IK8	191.5^{bcd}	88.0^{c}	494.2^{c}	78.0^{cd}	80.2^{de}	16.7^{ab}	38.8^{abc}	73.7^{b}	153.0^{b}
Un 44052* Ddhi9445	200.0^{ab}	94.2^{bc}	607.4^{ab}	76.5^{d}	79.5^{de}	17.3^{a}	40.7^{a}	71.3^{b}	155.4^{b}
Un 44052 * IK58	210.0^{a}	96.0^{abc}	663.1^{a}	78.5^{cd}	80.8^{d}	17.1^{a}	38.8^{abc}	68.0^{bcd}	119.7^{cd}

Number followed by the same letter in the same column are not significant difference at 0.05 probability level.

The data in table 4, reveals the effect of spring season 2015 and 2016 on all studied traits.The results showed that the spring 2015 was superior to spring 2016 in leaf area cm^2, days to 75% tasseling and silking, yield and yield components except the plant height and ear height. Similar results have been reported in maize by Grzesiak, (2001) and Ihsan *etal*. (2005) who indicated that the genotypic variability among various maize genotypes for different traits is associated with the season (max.of growing and min.temp. and Humidity were 30.7ºC, 19.14ºCand 56.7 in spring 2015 while max. and min. temp. and Humidity was 36.1ºC, 20.7ºC and 62.0 respectively) which have a modifying effect on the growth and development of maize plants.

Table 4. Effect the spring season 2015 and 2016 on various maize traits

	Traits								
Seasons	Plant height (cm)	Ear height (cm)	Leaf area (cm^2)	Days to 75% Tassiling	Days to 75% Silking	No. of rows ear-^{1}	No. of kernels row^{-1}	300-kernel weight(g)	Kernel yield plant^{-1} (g)
Spring 2015	192.0^{a}	94.8^{a}	664.9^{a}	82.0^{a}	85.2^{a}	17.6^{a}	39.9^{a}	79.3^{a}	168.4^{a}
Spring 2016	1879.8^{a}	93.7^{a}	541.1^{b}	76.9^{b}	79.2^{b}	15.9^{b}	38.3^{b}	61.7^{b}	116.7^{b}

Numbers of followed by the same latter in the same column are statically not different at 0.05 probability level

The data in table 5 shows the effect of interaction between seasons and hybrids, for plant and ear height. The hybrids (HS x Ddhiq 445) and (Un44052 x Ik58) surpassed all hybrids with a mean values of 221.71cm and 121.67 cm for plant height and ear height respectively in spring 2015, while hybrid (OHxIK8) and hybrid (Un44052 x Ik58) in spring 2015 and produced the lowest values of 171.7 and 80.33 cm, respectively.

The hybrid (Ddhiq 445 x Ik58) exhibited highest mean leaf area of 760.0 cm^2 in spring 2015 ,while the spring 2016 produced the lowest leaf area of 438.4 cm^2 was produced by hybrid (Un44052 x Ik8) .Data regarding days to 75% tasseling and silking , the data revealed that the hybrid (Ik8 x HS)was earlier for days to 75% tasseling and silking which tasseld and silked during 71.0 and 73 days, in spring 2015 respectively whereas latest days to 75% tasseling and silking was recorded by hybrids (OH40 x Ik8), (Ddhiq 445 x IK58) and (Un 44052 x Hs) that were 88.6 ,91.0 ,89.6 and 93.6 days in spring season 2016 respectively. The data in the same table shows that the No.of rows ear^{-1}, the higher value was scored by the hybrid (Ik58 x 04HO) and recorded 20 rows in spring 2015 and the lower number of rows ear^{-1} was registered by hybrid (Ddhiq 445 X Ik8) in same season. For No.of kernel row$^{-1,}$ 300-kernel weight and kernel yield plant^{-1} (OH40 xIk8) obtained the highest values for these traits and they 46.3, 92.1 g and 224.9 g in spring season 2015,while the lowest value of these traits was appeared in hybrid(HS x Ddhiq 445) in spring the high value (46) for No.of kernel row^{-1} and also the same hybrid recorded the high value for 300- kernel weight and gave 92.19 in spring 2015 .In spring 2016 and recoded 32.6, 54.12 and 85.5 respectively .Similar results were also obtained by Grzesiak,S.2001; Ihsan *etal.*,2005; Danaic, 2007 and Khan *etal.*, 2009 who reported that the interaction between season and maize hybrids was more effected on yield and yield component. From the results the hybrid (OH 40 x Ik8) in spring 2015 showed a genetic superiority to other maize hybrids and produced higher grain yield among the yield components, Table 6. described the genetic attributes of the traits. Heritability estimates along with genetic advance in more helpful in predicting the genetic gain under selection that heritability estimate alone (Singh,2000). In this study, the traits, plant and ear height, leaf area, days to 75% tasseling and silking ,No.of rows ear^{-1} ,No.of kernels rowe^{-1}, 300-kernel weight and kernel yield plant^{-1} obtained higher values of heritability, and also the traits leaf area and kernel yield plant^{-1} revealed high genetic advance, indicating that these traits are controlled by both additive and non-additive allele .High genetic advance coupled with heritability was observed for leaf area and kernel yield plant^{-1}. Therefore selection based on these last two mentioned traits will be effective (Table 6). The high heritability estimates and variances suggested that these traits were simply inherited .These results were in agreement with reports of Anshuman,2013 and Mohamed and Zakiya, 2014 .The small difference between PCV% and GCV% of all studied traits indicated that the existence of genetic variability's. As in plant crop the small differences between GCV% and PCV % indicated the possibility of genetic improvement in all the traits. Similar results have been confirmed by Khodadad *et al*.,(2013) who reported comparatively low Pcv and Gcv for yield, yield components and some agronomic traits.

Table 5. Effect of seasons and hybrids maize interaction on studied maize traits

Hybrids	Seasons	Plant height (cm)	Ear height (cm)	Leaf area (cm^{2})	Days to 75% tasseling	Days to 75% Silking	No. of rowsear^{-1}	No.of kernels row^{-1}	300-kernel weight(g)	Kernel yield plant^{-1}(g)
Ik8 xHS	Spring 2015	175.0 ^{fgh}	90.0 ^{cdefg}	645.0^{abcde}	71.0 ^{g}	73.0 ^{g}	18.6 ^{ab}	36.3 ^{defgh}	65.87 efgh	142.9 defg
	Spring 2016	210.0 ^{ab}	101.67^{bcde}	560.9 ^{efghi}	81.0 ^{bc}	84.0 ^{bc}	14.6 ^{de}	37.0 ^{defgh}	59.51 ^{ghi}	89.6 ^{J}
Mean		192.5 ^{defgh}	95.83	603.0	76.0	78.5	16.6	36.6	62.69	116.3
OH40 x IK8	Spring 2015	171.7 ^{h}	93.33 ^{cdefg}	641.7 abcde	77.6 cdef	79.67 def	17.3 abcd	46.3 ^{a}	92.1 ^{a}	224/9 ^{a}
	Spring 2016	185.0	96.67 ^{bcdef}	594.4 ^{defg}	88.6 ^{a}	91.0 ^{a}	18.0 ^{abc}	35.6 ^{defgh}	79.86 ^{bcd}	157.6 ^{d}
Mean		178.3 ^{defgh}	95.0	618.0	83.1	85.3	17.6	41.0	85.98	191.2
Ik58 x OH40	Spring 2015	168.3 ^{h}	100.0 ^{bcdef}	748.7 ^{ab}	78.6 ^{bcdef}	86.6 cdef	20.0 ^{a}	40.0 ^{bcdef}	75.32 ^{cde}	160.9 ^{d}
	Spring 2016	185.7 ^{defgh}	102.33 ^{bcd}	542.9 ^{efghi}	82.3 ^{b}	86.8 ^{b}	15.3 ^{cde}	44.0 ^{abc}	70.44 ^{def}	155.5 ^{d}
Mean		177.0	101.17	645.8	80.5	83.3	17.6	42.0	72.88	158.2
HS x Ddhiq445	Spring 2015	221.71 ^{a}	121.67 ^{a}	661.7^{abcde}	79.9^{bcd}	82.3^{cde}	16.0 ^{bcde}	38.6^{cdefgh}	66.94 ^{efg}	123.1 ^{fgh}
	Spring 2016	172.0 ^{gh}	89.0 ^{defg}	462.8 ^{hi}	75.3 ^{ef}	79.3 ^{ef}	16.6 ^{bcde}	32.6 ^{h}	62.64 ^{fghi}	120.9 ^{gh}
Mean		196.8	105.33	562.2	77.5	80.9	16.3	35.6	64.79	122.0
Ddhiq445x Ik58	Spring 2015	176..7 ^{efgh}	105.0 ^{bc}	760.0 ^{a}	76.0 ^{def}	79.6 ^{def}	16.6 ^{bcde}	36.0 ^{defgh}	86.06 ^{ab}	146.0 ^{def}
	Spring 2016	187.7 cdefgh	85.0 ^{fg}	495.2 $^{fghi}_{i}$	80.3 ^{bc}	83.0 bcd	16.6 ^{bcde}	34.3 ^{fgh}	56.92 ^{hi}	120.5 ^{gh}
Mean		182.2	95.0	627.6	78.1	81.3	16.6	35.0	71.49	133.3
Ddhiq445x IK8	Spring2015	211.7 ^{ab}	93.33 cdefg	634.0 bcde	79.3 ^{bcde}	82.0 ^{cde}	14.0 ^{e}	34.6 ^{efgh}	67.05 ^{efg}	131.5 ^{efgh}
	Spring2016	171.7 ^{h}	61.67 ^{h}	597.1 ^{defg}	88.0 ^{a}	91.6 ^{a}	16.0 ^{bcde}	45.0 ^{ab}	59.15 ^{ghi}	118.1 ^{h}
Mean		191.7	77.5	615.6	83.6	86.8	15.0	39.8	63.1	124.8
Un44052 x HS	Spring2015	185.0	93.33^{cdefg}	571.7 ^{efgh}	74.6 ^{fg}	77.3 ^{f}	17.3 ^{abcd}	40.6 ^{abcde}	87.38 ^{ab}	191.1 ^{c}
	Spring2016	193.3 ^{bcdef}	95.0 ^{cdefg}	614.4 ^{cdef}	89.6 ^{a}	93.6 ^{a}	14.6 ^{de}	44.3 ^{abc}	54.12 ^{i}	112.6 ^{hi}
Mean		189.2	94.17	593.0	82.1	85.5	15.9	42.5	70.75	151.9
Un44052 x IK8	Spring2015	196.7 ^{bcde}	85.0 ^{fg}	550.0 efghi	78.0 ^{cdef}	80.0 ^{def}	18.0 ^{abc}	44.0 ^{abc}	85.0 ^{abc}	216.3 ^{ab}
	Spring2016	186.3^{cdefgh}	92.0 ^{cdefg}	438.4 ^{i}	78.0 ^{cdef}	80.3 ^{def}	15.3 ^{cde}	33.6 ^{gh}	62.5 ^{fghi}	89.8 ^{ij}
Mean		191.5	88.5	494.0	78.0	80.1	16.6	38.8	73.75	153.0
Un44052 x Ddhiq 445	Spring2015	193.0 ^{bcdef}	86.0 ^{efg}	728.0 ^{abc}	74.6 ^{fg}	77.3 ^{f}	18.6 ^{ab}	41.6 ^{abcd}	88.27 ^{ab}	193.3 ^{bc}
	Spring2016	207.0 ^{abc}	102.33^{bcd}	486.7 ^{ghi}	78.3 ^{bcdef}	81.6 ^{cde}	16.0 ^{bcde}	39.6^{bcdefg}	54.4 ^{i}	117.4 ^{h}
Mean		200.0	94.17	607.4	76.5	79.6	17.3	40.6	71.33	155.4
Un44052 x IK58	Spring2015	198.0 ^{bcd}	80.33 ^{g}	708.3^{abcd}	79.0 ^{bcde}	80.3 ^{def}	18.8 ^{ab}	41.0 ^{abcd}	79.09 ^{bcd}	154.0 ^{de}
	Spring2016	221.7 ^{a}	111.67 ^{ab}	617.9 ^{cdef}	78.0 ^{cdef}	81.3 ^{cde}	15.3 ^{cde}	36.6 ^{defgh}	57/00 ^{hi}	85.5 ^{a}
Mean		210.0	96.27	663.1	78.5	80.8	17.0	38.8	68.05	119.7

Numbers of followed by the same letters in same column are statistically not different at 0.05 probability level.

Table 6. Genetic parameters for various maize traits

Traits / parameters	$^{2}\sigma g$	$^{2}\sigma e$	$^{2}\sigma pH$	H.b.s	G Mean	Gcv%	Pcv%	Ecv%	GA	GAM%
Plant height (cm)	188.07	46.94	235.01	80.02	190.9	7.18	8.03	3.59	21.58	11.30
Ear height(cm)	100.52	25.77	126.29	79.59	94.27	3.44	11.92	5.38	15.74	16.69
Leaf area(cm^{2})	3919.33	1613	5532.33	70.84	603.0	10.38	12.33	6.66	92.73	15.37
Days to75%tasseling	14.80	1.67	16.47	89.98	79.42	4.84	5.07	1.62	6.42	8.09
Days to75% silking	15.83	1.20	17.03	92.95	82.22	4.83	5.01	1.33	6.75	8.21
No.rows ear-^{1}	0.99	0.96	1.95	50.07	16.71	5.95	8.35	5.86	1.23	7.36
No.kernels row^{-1}	11.99	3.96	15.95	75.17	39.12	8.85	10.20	5.08	5.28	13.50
300-kernels weight (g)	88.18	10.09	98.27	89.73	70.48	13,32	14.06	4.50	15.65	22.20
Kernel yield plant^{-1}(g)	1096.17	54.70	1150.87	95.52	142.57	23.22	23.79	5.18	57.02	39.99

Key. $^{2}\sigma g$ = genetic variance, $^{2}\sigma e$ =Environment variance, $^{2}\sigma pH$ =Phenotypic variance, G-Mean =grand mean, Gcv % ,pcv% and Ecv, genetic, Phenotypic , Environment coefficient variability .

The results in table 7 show the correlation between the traits. Kernel yield plant^{-1} was positively correlated with leaf area and 300-kernel weight and negative correlated with plant and ear height, days to 75% tasseling and silking ,while 300-kernel weight depicted significant positive correlation with leaf area 0.323 and negative with plant height and days to 75% tasseling and silking .No. of rows ear^{-1} exhibited positive correlation coefficient with Leaf area (0.409) 300-kernel weight 0.508 and kernel yield plant^{-1} (0.545),Moreover, positive and significant correlation showed between No. of kernels row^{-1}300-kernel weight 0.289 and kernel yield plant^{-1} with value of 0.509. Similar results were observed by Refig *etal*;Ali *etal*., (2010); Zahra *etal*., (2013) and Kumar (2014).

4. CONCLUSION

Heritability estimates with genetic advance is the most important to help in anticipate the genetic gain under selection than heritability estimate alone .high genetic advance joined with heritability was observed for Leaf area and kernel yield plant^{-1},the small difference between Pcv and Gcv were existed for all traits, plant height Leaf area, 300-kernel weight and kernel yield plant^{-1} also showed high genetic advance coupled with high heritability therefore, these traits are very important in any selection process aimed to improve grain yield in maize.

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تقدير بعض المعالم الوراثيه والارتباط ونسبه التوريث في صفات مختلفه من الذره الصفراء

خلاصة البحث:

زرعت عشرة هجن من الذره الصفراء في ربيع عام 2015 و2016 في حقل كليه الزراعة /جامعه دهوك . وضعت جميع المعاملات في تصميم القطاعات العشوائيه الكامله وبثلاث مكررات لدراسة نسبة التوريث والتحصيل الوراثي والارتباط بين بعض المعالم الوراثيه ذات العلاقه بتوريث الحاصل وبعض الصفات الحقلية. أظهرت النتائج وجود فروقات معنوية بين الهجن لجميع الصفات المدروسة ولكلا الموسمين كما أ ظهرت النتائج أن التداخل قد اثر معنويا على جميع الصفات المدروسه .تفوق الموسم الربيعي لعام 2015 على الموسم الربيعي لعام 2016 في صفات المساحه الورقيه و 75% تزهير ذكري وأنثوي والحاصل ومكوناته وتفوق الهجين (Ik8 xOH40) على بقية الهجن في عدد الصفوف /عرنوص وعدد البذور /صف ووزن300 حبة وحاصل النبات كانت نسبة التوريث بالمعنى الواسع عاليه لجميع الصفات كما أظهرت صفتي المساحة الورقية وحاصل النبات نسبه توريث وتحصيل وراثي عاليين ولذا فان الانتخاب يكون فعالاً في هذه الحالة عند وضع برنامج لتطوير الذرة الصفراء . إرتبط حاصل النبات إرتباطاً موجباً مع المساحة الورقية وزن 300 حبه في حين أظهرت صفة عدد الصفوف /عرنوص ارتباطا موجبا معنويا مع المساحة الورقية و وزن 300 حبة وحاصل النبات.