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STUDYING THE COMPONENTS FOR YELLOW CORN PLANT (*ZEA MAYS* L.) BY USING FACTORIAL MATING SYSTEM

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Abstract

In this study eight synthetic cultivars of yellow corn were used are:(1) Maha, (2) Gadiz, (3) bohuth 106, (4) Aba 5018, (5) Sumer, (6) Forat, (7) Sara and (8) Aba 5019. They were introduced into a program for crossing according to the factorial co-ordination system proposed by (Comstcok, 1952; Robinson 1948). The synthetic cultivars were divided into two group, the first: It was used as parents (Males), with the four cultivars (Maha, Gadiz, 106 and Aba 5018), the second (Sumer, Forat, Sara and Aba 5019). The seeds of the eight parents and sixteen hybrids produced from it were cultivated in the field of Al-Mussaib Technical College using the Complete Randomized Blocks Design, with three replicates, in order to study the Gene interaction for the traits of yield components as well as the estimation of heterosis, and Combining Ability, the phenotypic variance was estimated and divided into its components: additional on the basis of parents (males and females), the average, dominance, and environmental. The main results of the study can be summarized as follows:

1. The parents and the first-generation crossing showed a significant difference at the 5% probability level in the trait of the weight of 100 grains compared with the rest of the traits.

2. The two crossings between (Maha × sumer) and (Aba 5018 × Aba 5019) showed a significant and desirable heterosis on the basis of the deviation of the first generation from the average of the parents for all the traits and the crossing (Maha × sumer) showed the highest heterosis due to the deviation of the first generation from the best parents of all traits.

3. The two crossings (Aba 5019 × Aba 5018) showed the effect of the specific ability on combining significantly and in the desired direction for most of the studied traits.

4. The values of environmental and genetic variability varied from zero for most of the studied traits. The dominance genetic variance showed more important than the additive genetic variance in the heritability of most traits.

5. The inability to selection in early generations due to the decrease values of the percentage of heritability in the narrow sense of these traits and the increase values of the percentage of heritability in the broad sense and to the studied traits.

6. The degree of dominance was greater than the one integer for most traits, Which indicates the presence of ultra-dominance for it.

Key words : *Zea mays* L., factorial mating system, heritability, heterosis.

Introduction

The yield of yellow corn (*Zea mays* L.) has been of great interest to the plant breeders for the ease of conducting the inoculation process because it is a Cross Pollinated Crops and Monoecious. Due to the lack in the production of the yellow crop in Iraq and deterioration its quality. It is important to move towards numerical breeding programs, which require first diversity in the adapted cultivars both for different environments or different uses. Therefore, it is the duty of plant breeders to continue to develop strains and cultivars of high quality and quality specifications that are suitable for the local importance in the country, and in order to reach this goal must adopt a suitable breeding program to improve it. From the steps which help to access these goals to select a group of cultivars with different origins to form a broad and varied genetic base which through their introduction into different mating systems, can obtain useful genetic information, such as identification of genetic behavior and the combining abilities for cultivars, the Hybrids and for traits

of yellow corn yield and its components. Hybridization is considered one of the most important techniques in finding hybrids that are tested for the selection of the superior from it in its traits that appropriate for the prevailing environment conditions and the hybridization gives to the production, a large variant and genetic and give the opportunity to elect new genetic structures to benefit from the phenomenon of hybrid power to produce new hybrids, It is also one of the most important ways to reach the conclusions related to Gene interaction and the general combining abilities for cultivars or strains and special for the hybrids in order to reach to a cultivar or more combine field specifications and productivity superior on the common origins in their composition. This phenomenon has been studied by (Nos *et al.*, 2011; Abdullah, 2011). One of the most important and broad breeding methods used in yellow corn is hybridization. The factorial mating system is considered one of the used methods to obtain good hybrids according to (Comstock and Robinson, 1952). Heritability is considered one of the most important genetic parameters for the selected traits. It reflects the amount of genetic variation for selected trait from generation to generation, which can be predicted by the amount of genetic yield obtained from the selection for quantitative trait. The high Heritability for the selected quantitative trait that associated with the yield, genetic gain does not guarantee the required unless this association is positive and significant. The objectives of this study are summarized to evaluate the performance of a group of yellow corn cultivars, to conducting individual Hybridizations between a group of yellow corn cultivars, Estimating the heterosis. Estimating the general and specific combining abilities for parents and first generation. Estimating the components of phenotypic and genetic variability and gene interaction. Estimating the heritability in the narrow and broad sense, and the average of dominance degree.

Materials and Methods

The study was conducted in the field belonging to Al-Mussaib Technical College for autumn and spring seasons for 2017 and 2018. In the autumn season eight synthetic cultivars of yellow corn were cultivated. All soil and crop service operations were conducted. Individual hybridizations were conducted between them according to the genetic design of the factorial mating.The number of resulted hybrid was 16 hybrid and the seeds of resulted hybrid and cultivars were conserved for cultivating in the spring season of 2018. The second design proposed by (Comstock and Robinson, 1952) was followed, according to this mating method, the cultivars (Sumer, Forat, Sara, Aba 5018) were adopted as female, which are symbolized by (5, 6, 7, 8), respectively. The cultivars (Maha, gadiz, bohuth 106, Aba 5019) were treated as male, which are symbolized by (1, 2, 3, 4), respectively. A 16 (4 x 4) individual hybrids were obtained between them, where soil were prepared and seeds were cultivated, with Grid system on equal dimensions (75 x 25 cm) between one line and another and between one plant and another, with plant intensity of (53333 plant.ha^{-1}). Urea fertilizer (46%) N were used as a nitrogen source, with average of (200 kg N.ha^{-1}). The first batch was added at cultivation, the second after one month of cultivating and the third at the flowering, adding the calcium superphosphate (46% P_2O_5), with average of (200 kg P_2O_5.ha^{-1}), one batch at cultivation. Atrazine pesticide (80% Effective substance) was sprayed, with amount of (4 kg.ha^{-1}) after cultivating and before emergence to control the annual thickets with the weeding procedure when needed.

To evaluate the performance of the genotypes (parents and first generation genes), the variance analysis was performed according to the Randomized Complete Block Design (RCBD) and for all studied traits. The general and specific combining abilities were studied according to (Comstock and Robinson, 1948 and 1952). The hybrid data were analyzed according to the factorial hybrid design proposed by (Comstock and Robinson, 1948 and 1952) according to the fixed model. The equation of the mathematical model is:

$$i = 1,2.....\mu$$

$$yijk = \mu + mi + fj + (mf)ij + rk + eijk \; j = 1,2.....f$$

$$k = 1,2.....r$$

The strength of the hybrid was calculated by comparing the first-generation deviation from the average of the highest parents to the studied traits. Laosuwan and Atkins (1977) defined the term Heterobelitosis either mathematically as shown in the following equation:

$$H\% = \frac{\overline{F1} - \overline{Hp}}{\overline{Hp}} \times 100$$

Standard deviation (S.E) was used to compare the averages of the heterosis

$$S.E = \frac{H - 0}{\sqrt{VH}}$$

The additional variance, dominance variance and the environmental variability were calculated based on the expected average variance of the analysis method according to the factorial mating method, in addition to calculating the percentage of heritability in the senses:

broad and narrow, where the measurements were conducted in the autumn season on ten conserved plants taken randomly from each experimental unit. The data were tabulated in tables and analyzed statistically according to the design used for all traits and spring and autumn seasons. The degree of dominance was estimated according to the following equation:

$$\bar{a} = \sqrt{\frac{2\sigma^2 D}{\sigma^2 A}}$$

Results and Discussion

The results of the genetic analysis showed significant differences at the level of 5% for all traits except for the traits of grains number in the cob. This indicates the existence of genetic differences between genotypes, which requires studying the genetic behavior of these traits to know the gene interaction that controls the inheritance of these traits. The average values of the number of rows in the cob ranged from 15.67 to 18.90 for males (2 and 8), respectively. The averages values ranged from 16.00 to 19.10 for the two crosses (2 × 8) and (1 × 5), respectively. As for the number of grains in the row, the average values ranged between (39.82 to 44.11) for males (4 and 5), respectively. The average values ranged from 38.68 to 47.10 for the two crosses (2 × 7) and (4 × 8), respectively. As for the number of grains in cob, The average of parents ranged between 402.50 to 610.67 for males (6 and 5), respectively, while the crosses values ranged from (420.67 to 679.00) for the crosses (4 × 5) and (1 × 5), respectively. For the weight of 100 grains, the averages gave values ranging from 16.23 to 21.37 for males (3 and 5), respectively. The average values for the crosses between 17.00 and 23.56 for the two crosses (3 × 7) and (2 × 5), respectively. As for plant yield (g), the average values ranged from 114.94 to 206.32 for males (7 and 8), respectively. The average values for the crosses ranged between 128.91 and 230.46 for the two crosses (3 × 7) and (1 × 5), respectively. From above, it is clear that there are differences between the parents used in the study on the one hand and greater differences between the resulting crosses on the other hand. It is noted the excelling of the average crosses of the parents and the General average in all the studied traits. This indicates the existence a good heterosis in the crosses. For the existence of these differences, the study of the genetic behavior of the different traits was continued to identify the gene interaction that governs its genetic. In order to reach the desired goal, the variance analysis for the crosses was conducted according to the factorial mating design as shown in table (11). As we observe through it that the males differed significantly at the 5% probability level in the weight of 100 grains compared with the rest of the traits where it did not reach the significant limit. The females showed significant differences at the 5% probability level in most traits except the number of rows in cob and the number of grains in cob where it did not reach the significant limit, it is noted that there is significant interaction between parents at the 5% probability level for all traits, except for the number of grains in cob as it did not reach the significant limit.

Heterosis

Heterosis based on the deviation of first - generation from the lowest and highest parents

As for the number of rows in cob, it gave a negative significant Heterosis in the unwanted direction for 11 crosses, the highest of which were the two crosses (2× 8) and (1×8) where their values amounted of (-15.34, -14.11), respectively. As for the number of rows in cob, it gave a significant negative heterosis in the unwanted direction for 11 crosses, the highest of which were the two crosses (2×8) and (1×8) where their values amounted of (-15.34, -14.11), respectively. Three crosses gave a positive heterosis in the desired direction, the highest of which were the two crosses (3×6) and (1×5) where their values amounted of (9.32 and 6.70), respectively, while the crosses (4×8) gave a positive insignificant heterosis amounted of 0.23. As for traits of the number of grains in the row, a negative significant heterosis was given in the unwanted direction for 14 crosses, the highest of which were the two crosses (4×5) and (1×7) where their values amounted of (-12.22 and -10.31), respectively. The two crosses (4×8) and (1×5) gave a significant positive heterosis in the desired direction amounted of (9.48, 5.19), respectively. The trait of the number of grains in cob gave a significant negative heterosis in the unwanted direction for nine crosses, the highest of which were the two crosses (4 × 5) and (2 ×8) where their values amounted of (31.11, 17.27), respectively. Five crosses gave a significant positive heterosis in the desired direction, the highest of which were the two crosses (1×5) and (3×7) where their values amounted of (11.19 and 10.10), respectively, while the crosses (3×8) gave an insignificant positive heterosis amounted of 0.46. The trait of the weight of 100 grains gave a significant negative heterosis in the unwanted direction for six crosses, the highest of which were the two crosses (4×5) and (3×5) where their values amounted of (-16.12, -10.56), respectively. Eight crosses gave a significant positive heterosis in the desired direction, the highest of which were the two crosses (4×8) and (2×7)

Table 1: Average values of parents and first generation for different traits in yellow corn.

Traits	Number of rows in cob	Number of grains per row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)
1	17.90	43.34	592.00	18.60	161.86
2	15.67	40.72	518.73	17.47	127.39
3	16.04	41.19	503.50	16.23	116.42
4	16.70	39.82	529.33	17.83	133.88
5	17.57	44.11	610.67	21.37	175.30
6	16.10	41.27	402.50	17.97	127.98
7	17.40	40.29	458.67	16.37	114.94
8	18.90	43.02	594.33	19.30	206.32
1×5	19.10	46.40	679.00	22.23	230.46
1×6	16.83	41.21	513.67	17.61	149.22
1×7	17.03	38.88	508.83	19.11	166.81
1×8	16.23	39.71	562.50	19.76	152.18
2×5	17.07	40.33	581.07	23.56	187.17
2×6	17.03	38.91	557.67	18.23	156.14
2×7	17.07	38.68	499.47	20.20	141.32
2×8	16.00	41.53	491.67	17.84	166.48
3×5	16.97	39.59	545.53	19.11	181.99
3×6	17.60	39.87	450.93	17.42	138.73
3×7	16.67	39.39	554.33	17.00	128.91
3×8	17.13	39.90	597.07	17.50	142.83
4×5	16.97	38.72	420.67	17.92	142.88
4×6	16.90	39.58	577.33	19.77	175.31
4×7	16.90	39.70	541.67	20.12	144.31
4×8	18.94	47.10	614.00	23.17	219.93
General average	17.11	40.96	537.71	18.987	157.865
LSD 5%	1.81	5.42	.....	3.921	67.264
LSD 1%	2.42	7.25	.....	5.238	89.864

where their values amounted of (20.03 and 15.63), respectively. The trait of the plant yield (g) gave a significant negative heterosis to the undesirable direction of five crosses, the highest of which were the two crosses (3×8) and (1×8) where their values amounted of (-30.78 and -26.24), respectively. In addition, nine crosses gave a significant positive heterosis in the desired direction. the highest of which were the two crosses (1×5) and (4 × 6) where their values amounted of (31.46 and 30.95), respectively. It is clear from the previous results that the crossing (1 × 5) gave a significant heterosis in the desired direction for all the traits, and the crossing (1 × 7) gave a significant heterosis in the desired direction for the trait of the weight of 100 grains. The crossing (2 × 5) gave a significant heterosis in the desired direction for the trait of the weight of 100 grains and plant yield. The crossing (2 × 6) gave a significant heterosis in the desired direction for the trait of the number of rows in the cob and the number of seeds in the cob and the plant yield. The crossing (2×7) gave a significant heterosis in the desired direction for the trait of the number of rows in the cob and plant yield, and the crossing (3×6) gave a significant heterosis in the desired direction for the trait of the number of rows in the cob and plant yield, the crossing (3×7) gave a significant heterosis in the desired direction for the trait of the number of grains in cob, the weight of 100 grains and plant yield, the crossing (4×6) gave a significant heterosis in the desired direction for the trait of the weight of 100 grains and plant yield, the crossing (4×7) gave a significant heterosis in the desired direction for the trait of the weight of 100 grains, the crossing (4×8) gave a significant heterosis in the desired direction for the trait of the number of grains in the row, the number of grains in the cob and the weight of 100 grains and the plant yield. The results agree with (Al-Salem *et al.*, (2013); Faisal (2013); Saudi (2013); Al-Juhishi, (2015); Al-Amiri, (2016).

Combining ability

The general Combining ability for parents

It is noted that the male (1) is composed in a non-significant and in the desired direction with all the studied traits, either the male (2), its composing was undesirable form for the traits of the number of grains in the row and the number of grains in the cob and the plant yield (g) and its composing is insignificant for the traits of the number of rows in cob and weight 100 grains (g). As for the male (3), it is considered to be significant but in the undesirable direction with the weight of 100 grains, and its composing was not desirable with the rest of the traits. The male (4), its composition was not significant in the undesirable direction with the number of grains in the cob, but the rest of the traits were in the desired direction and not significant. Female (5) showed a non-significant composing with all traits. Female (6) composed in a non-significant and undesirable direction with all traits. Female (7) composed in a non-significant and undesirable direction with all traits. Female (8) composed in a non-significant and undesirable direction with all traits.

Specific Combining ability for Hybrids

As for the traits of the number of rows in cob, the crossing (1×8) showed a significant Specific Combining ability in the desired direction amounted of (1.59, 1.43), respectively,while the two crosses (4×8) and (1×5)

Table 2: Heterosis based on the deviation of first - generation from the lowest and highest parents.

Traits / Crosses	Number of rows in cob	Number of grains in row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)
1×5	6.70	5.19	11.19	4.02	31.46
1×6	-5.96	-4.92	-13.23	-5.32	-7.81
1×7	-4.84	-10.31	-14.05	2.76	3.05
1×8	-14.11	-8.38	-5.36	2.37	-26.24
2×5	-2.85	-8.56	-4.85	10.25	6.77
2×6	5.80	-5.71	7.51	1.45	22.01
2×7	-1.92	-5.02	-3.71	15.63	10.93
2×8	-15.34	-3.46	-17.27	-7.55	-19.31
3×5	-3.42	-10.25	-10.67	-10.56	3.81
3×6	9.32	-3.39	-10.44	-3.04	8.40
3×7	-4.21	-6.80	10.10	3.85	10.73
3×8	-9.35	-7.25	0.46	-9.34	-30.78
4×5	-3.42	-12.22	-31.11	-16.12	-18.50
4×6	1.20	-4.10	9.07	10.06	30.95
4×7	-2.87	-1.46	2.33	12.82	7.79
4×8	0.23	9.48	3.31	20.03	6.59
SE	1.69	1.40	2.91	2.54	4.67

Table 3: Estimates of the effect of GCA on each of parents for the studied traits.

Traits / Parents		Number of rows in cob	Number of grains in row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)	Traits Crosses
Male	1	0.147	1.019	22.538	0.268	10.624
	2	-0.361	-0.667	-10.996	0.547	-1.263
	3	-0.061	-1.095	-6.496	-1.653	-15.927
	4	0.275	0.744	-5.046	0.837	6.566
Female	5	0.372	0.730	13.104	1.296	21.582
	6	-0.061	-0.640	-18.563	-1.151	-9.190
	7	-0.236	-1.620	-17.388	-0.302	-18.704
	8	-0.075	1.530	22.846	0.157	6.313
Se		0.696	1.768	78.277	1.339	26.549

showed a significant Specific Combining ability in the desirable direction whose values were (1.59, 1.43), respectively,while nine crosses showed significant Specific Combining ability in the undesirable direction, the highest was the crossing (4×5) where amounted of (-0.83). As well as four crosses showed significant Specific Combining ability in the undesirable direction, the highest was the crossing (3×6) which amounted of (0.57). As for the traits of the number of grains in the row, the two crosses (1×8) and (4×5) showed a significant Specific Combining ability in the undesired direction where their values amounted of (-3.37 and -3.28), respectively, While the two crosses (4×8) and (1×5) showed a significant Specific Combining ability in the desired direction where their values amounted of (4.30, 4.12), respectively, While the six crosses showed a Specific Combining ability is non-significant in the desired direction, the highest was the crossing (3×8) where amounted of (-1.07), Six crosses showed a Specific non-significant Combining ability in the desired direction, the highest was the crossing (3×6) where amounted of 1.07. As for the number of grains in cob, the crossing (4×5) showed a significant Specific Combining ability in the undesired direction amounted of -130.85, While the eight crosses showed a Specific non-significant Combining ability in the desired direction, the highest was the crossing (1×5) where amounted of 99.90, and the seven crosses showed a Specific Combining ability is non-significant in the undesired direction, the highest was the crossing (3×6) where amounted of -67.47.As for the trait of the weight of 100 grains, the two crosses (4×5) and (2×8) showed a significant Specific Combining ability in the undesired direction where their values amounted of (-3.62 and -2.27), respectively, while the two crosses (4×8) and (2×5) showed a significant Specific Combining ability in the desired direction where their values amounted of (2.76 and 2.31), respectively. As well as six crosses showed a non-significant Specific Combining ability in the desired direction where their values amounted of (-0.92), and Six crosses showed a non-significant Specific Combining ability in the undesired direction, the highest of which was the crossing (1×5), which amounted of 1.25. As for the trait of the plant yield, the crosses (4×5) showed a significant Specific Combining ability in the undesired direction amounted of 49.31, while the crosses (4×8) showed a significant Specific Combining ability in the desired direction amounted of 43.01, the eight crosses showed a non-significant Specific Combining ability in the undesired direction, the highest of which was the crossing (1×8), which amounted of (-28.80), Six crosses showed a non-significant Specific Combining ability in the undesired direction, the highest of which was the crossing (1×5), which amounted of 34.21. It is clear from the previous results that the mixing (1×5) showed a significant Specific Combining ability in the desired direction for the traits of the number of rows in cob and the number of grains in the row, and the crosses (4×8) showed a non-significant Specific Combining ability in the desired direction for the traits of the number of rows in cob, the number of grains in a row, the weight of 100 grains and

Table 4: Heterosis based on the deviation of first - generation from the lowest and highest parents.

Traits / Crosses	Number of rows in cob	Number of grains in row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)
1×5	1.43	4.12	99.90	1.25	34.21
1×6	-0.41	0.30	-33.77	-0.92	-16.26
1×7	-0.03	-1.05	-39.78	-0.26	10.85
1×8	-0.99	-3.37	-26.35	-0.08	-28.80
2×5	-0.10	-0.26	35.50	2.31	2.81
2×6	0.30	-0.31	43.76	-0.58	2.55
2×7	0.51	0.43	-15.61	0.54	-2.75
2×8	-0.72	0.14	-63.65	-2.27	-2.61
3×5	-0.50	-0.58	-4.54	0.06	12.29
3×6	0.57	1.07	-67.47	0.82	-0.20
3×7	-0.19	0.57	34.75	-0.46	-0.50
3×8	0.12	-1.07	37.25	-0.42	-11.60
4×5	-0.83	-3.28	-130.85	-3.62	-49.31
4×6	-0.47	-1.06	57.48	0.68	13.90
4×7	-0.29	0.05	20.64	0.18	-7.59
4×8	1.59	4.30	52.74	2.76	43.01
SE	0.98	2.50	110.70	1.89	37.55

plant yield, and the crosses (2×5) showed a significant Specific Combining ability in the desired direction for the trait the weight of 100 grains. The previous results agree with (Al-Eeilyawi, 2013; Faisal, 2013; Fayyad *et al.*, 2011; Ghallab, 2014; Ramadan, 2010).

Components of phenotypic variance

As for the trait of the number of rows in cob, The variance in interaction between parents was higher where amounted of 2.680 when compared to male and female variance separately. The main role of genetic variance was 2.728 when compared to environmental variance where amounted of 0.727. When dividing the genetic variance, the dominance variance was higher than the additional variance where amounted of 2.680 and additional variance amounted of 0.048, Which illustrates the importance of genetic variance in the Heritability of this trait. As for the number of grains in the row, we note that the variance of interaction for parents was higher when amounted of 21,842 compared to the variance of parents (male and female) separately. The main role of genetic variance amounted of 26.376 when compared to the environmental variance which amounted of 4.688. When dividing the genetic variance we note that the dominance variance was higher where amounted of 21,842 compared to the additional variance of 4.534, Which illustrates the importance of genetic variance in the Heritability of this trait. As for the trait of the number of grains in cob, we note that the interaction for parents was high where amounted of 10709.02 while the male variance and the female variance gave zero value due to sampling error, and when comparing the genetic variance with the environment variance, we find that the environmental variance excelled on the genetic variance, the dominance variance is excelled on the additional variance and that the additional variance gave zero value due to the sampling error. For the trait of the weight of 100 grain, the interaction of the parents was higher, amounted of 12.346 when compared to the variance of the male and female separately, and the genetic variance had a main role where amounted of 16.065 when compared to the environmental variance which amounted of 2.691. When the components of genetic variance were divided, we found that the dominance variance excelled on the additional variance which amounted of 12.346 while the additional variance amounted of 3.719 indicating the importance of genetic variance in the Heritability of this trait. As for the trait of the plant, the variance between the parents was higher where amounted of 1803.216 compared to the variance of the male and female separately. The genetic variance excelled on the environmental variance where amounted of 2351.567 while the environmental variance was 1057.259. When the genetic variance was divided, we note that the dominance variance had a main role where amounted of 1803.216 when compared with the additional variance which amounted of 548,351, indicating the importance of genetic variance in the Heritability of this trait.

Percentage of Heritability and average of dominance

Where it is noted that the values of Heritability in the broad sense was high for the trait of male and female

Table 5: The components of the phenotypic variance of the different traits in the yellow corn.

Components of the phenotypic variance	Number of rows in cob	Number of grains in row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)
$\sigma^2 m$	0.06	2.75	2134.98-	4.17	195.89
$\sigma^2 f$	0.02	6.31	-1276.26	3.26	900.80
$\sigma^2 mf$	2.68	21.84	10709.02	12.34	1803.21
$\sigma^2 A$	0.04	4.53	-1705.62	3.71	548.35
$\sigma^2 D$	2.68	21.84	10709.02	12.34	1803.21
$\sigma^2 G$	2.72	26.37	9003.40	16.06	2351.56
$\sigma^2 E$	0.72	4.68	9190.97	2.69	1057.25
$\sigma^2 P$	3.45	31.06	18194.37	18.75	3408.82

Table 6: Percentage of Heritability and the degree of dominance.

Percentage of Heritability	Number of rows in cob	Number of grains in row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)
h ²%b.s	78.95	84.90	49.48	85.65	68.98
h ²%n.s	1.37	14.59	-9.37	19.82	16.08

Table 7: Analysis of variance in the factorial mating method for different traits in yellow corn.

Mean squares MS						
Percentage of Heritability	Number of rows in cob	Number of grains in row	Number of grains in cob	Weight 100 grains (g)	Plant yield (g)	Number of rows in cob
Replicates	2	0.704	82.853	9913.9	5.182	6077.29
Cross	15	1.990*	19.958*	11963.2	12.709*	2526.72*
Male	3	0.925	12.944	2786.01	15.216*	1644.95
Female	3	0.815	23.637*	5362.17	12.478*	3759.67*
F × M	9	2.737*	21.069*	17222.74	11.950*	2409.67*
Experimental error	30	0.727	4.688	9190.97	2.691	1057.25

flowering date, the number of rows in cob and the number of grains in the row, the weight of 100 grains and the plant yield. Due to rise the values of genetic variance compared to phenotypic variance and decrease of the environmental variance. While the percentage of Heritability in the broad sense was moderate in the number of grains in cob due to approximate the percentages of genetic and environmental variance, since the genetic and environmental variance played a large role in the Heritability of these traits. The percentage of Heritability in the narrow sense was low for the rest of trait due to the reduction of the additional genetic interaction and control of the dominance genetic interaction in their Heritability. As for the degree of dominance, it was given ultra-dominance because it was greater than one for all traits except the number of grains in the cob where it did not give the value of the degree of dominance. This results agree with (Tazneei, 2011; Al-Doleimy and Al-Draghi, 2011; Yahya Wadud, 2014; Abdullah, 2014; Al-Doleimy *et al.*, 2014).

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