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Estimates of Genetic Parameters Using Populations in Faba Bean *(Vicia Faba* L.*)*

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ABSTRACT

To improve yearlings and high potential yield of faba bean. Six populations P_1, P_2, F_1, F_2, BC_1 and BC_2 produced from three faba bean crosses , namely (Giza 429 x Giza 674), (Masr 1 x Giza 674) and (Giza 40 x Giza 402)) were conducted during three successive winter seasons 2013/14, 2014/15 and 2015/16. The experiment was conducted at the Experimental Farm., Faculty of Agricultural, Al-Azhar University (Assiut Branch). Recorded six generations mean days to maturity, branches number, number of pods, plant height per plant, 100 seed weight and seed yield per plant were exposed to upgrade test, and six abistatic detection method parameters and estimates of m, d, h, I, j and l parameters. The epistasis genes effects were reveal by the results that cannot be ignored when creating new program of breeding to expand faba bean inhabitants of economic traits. And controls inherit all attributes and non-additive gene effects study added, with a value greater than the influence of genes dominate one in most cases. Among other elements added impact can be solved, i.e. , stabilizer × additive (I) interaction type and was also great and form the chief part of the effects of gene. (H) and (l) the consultation if days to maturity in two crosses, crosses the plant height in three, number one, cross sections and reflects the pods number / plant, 100 seed weight in three crosses and seed yield / plant in two crosses, indicating the duplicate type of interaction is allelic in these qualities. Accidentally discovered a sign and magnitude.

INTRODUCTION

Faba bean (Vicia faba L.) is one of the main crops grown pulse seeds in Egypt. It is widely regarded as a good source of protein, starch, cellulose and minerals in developing countries, as well as for the animals in the industrialized countries. In addition, Faba bean is one of the most efficient fixers of atmospheric nitrogen and enhance total soil nitrogen fertility through biological N_2-fixation. Improvement of earliness and high yield potential are the primary objectives of faba bean breeding program. Understanding of the fundamental natural of the action and interactions of genes complicated in the inheritance of quantifiable. characters remains very helpful to breeder of plant in their evaluation of various selection and breeding procedures. The breeding system need to be fitted to the type of gene action to maximize the results of improvement. Generation mean analysis techniques have been used to obtain considerable information on the types of gene action controlling earliness and seed yield as well as its attributes. El-Refaey (1999) reported that two types of epistatic gene effects of basic genetic mechanism for important dates of flowering and maturity. Non-allelic genes interaction and was fond of participating in controlling genetic variation between genotypes ful for all crosses in all traits studied with some few exceptions, El-Deeb *et al*.,(2008) . Mohmoud *et al*., (1984), El-Hifny *et al*., (2001), Attia and Salem(2006) Genetic effects were added and significant dominance of all thoughtful qualities epistatic gene effects seem most important attributes of faba bean. Al-Fahady, (2009) found that the added genes influences and additive × additive interaction of large flowers, and the maturity date, plant height, number of pods/plant, weight 100-seed and seed yield/plant. While the effects of the dominance of big seed yield/plant, number of pods/plant. Food additives x gene effect added (AA) was crucial in most expresses all Abo Mostafa *et al*., (2014).On the other hand, Darwish *et al*. (2005); Attia (2007) and El-Hady *et al*. (2008) described that the effect of genes non-additive and important for the numbers of branche, seeds than effect of additive and seed yield/plant pods. However, the additive variance was imperious of the date of flowering and100 seed weight.

The current investigation was conducted to assess the importance of epistatic gene effects additive, dominance and digenic epistatic effects of gene for earliness typescripts and seed yield in addition to its attributes in six faba bean.

MATERIALS AND METHODS

The current investigation was conducted in the experimental farm complete at College of agriculture, "Al-Azhar University branch (conf) from 2013/14, 2014/15 and 2015/16 growing seasons to study gene action types control airlinis, seed yield, as well as their attributes in six faba bean inhabitants (F1, F2, P1, P2, BC1 and BC2) of 3 crosses (674 x 429 Giza, Egypt 1 x 674 Giza and Giza 40 x 402). Contained in the parent table and the percentages of these genotypes faba bean genotypes are obtainable in (Table 1):

Table 1. Origen and studied parents pedigree:

Serial	parents	Origin	Maturity
1	Masr 1	Egypt, through hybridization.	Early
2	Giza 429	Egypt, selection from Giza 402 .	Early
3	Giza 40	Egypt, selection from Rebaya 40.	Early
4	Giza 402	Egypt, through hybridization.	Moderate
5	Giza 674	Egypt, through hybridization.	Early

Experimental layout:

In the season of 2013/14, the parents crossed of F1 hybrid seed production. In the season 2014/15 F1 hybrid plants were crossed back to their parents to produce a BC1 (F1 X P1) and BC2 generations (F1 X P2). In addition she solved F1 plants to produce seeds.

In the 2015-16 season, plants (F1, F2, P1, P2, BC1 and BC2) planted in randomized design of complete block with 3 occurrence. Cultivated each entry in a row length of 3 meters and 60 cm with one seed hills spaced from each 20 cm on one side of the point. Totally plots consisting of parts 2, 2, 4, 2 and 2 P1, P2, F1, F2 , BC1 and BC2, respectively. And followed the recommended practices for producing bean bean. Thoughtful qualities were recorded in ten stations guarding every piece of land to each of parents web acrostics and F1 plants guarded 40 F2 generation and examined the following characters; the days to maturity date: number of days from seeding to maturity over 90% of pods, plant height. Collected data were analyzed statistically using traditional two way analysis of variance based outlined by Steel and Torrie (1980). The scaling tests of A, B and C were estimates for example according to Hayman and Mather (1955). In non-allelic interaction, analysis proceeded was to estimate the types of work among the agencies involved using six genetic parameters model i.e., (m, d, h, i, j and L) m= the scale origin. That reflects the contribution because generally means in addition to the effects of space and spatial constant interaction, d = the sum of the additive effects of genes, h = total effects dominate genes, I = total food additive × additive effects of genes, j = the sum of the additive × dominance gene effects for = total dominance × dominance gene effects. outlined by Hayman (1958). Inbreeding depression, heterosis, phenotypic and the variability genotypic coefficient calculated outlined by Singh and Chaudhary (1977) as follows:

Heterosis from the mid- parents $[H(M.P)\% = (F_1\text{-}M.P)/M.P)*100]$

Heterosis deviation = F_1-M.P

Variance of heterosis deviation = $VF_1 +1/4(VP_1 +VP_2)$

Heterosis from better-parents $[H(B.P)\%=(F_1\text{-}B.P)/B.P)*100]$

The deviation of heterosis = F_1 - B.P

Heterosis deviation Variance = VF_1 + VB.P

T test was used to test the significance of the overhead estimates from scratch as shown by the following equation:

t = (Deviation-Zero)/(Variance of deviation)$^{0.5}$

Depression Stud; their values from the calculation next.:

Inbreeding despair of $F_1 = (F_1 – F_2 / F_1)*100$

Inbreeding depression Variance (V.I.D) for $F_1 = VF_1 +VF_2$

t.I.D = F_1 - F_2 / V.I.D$^{0.5}$

phenotypic Estimation and the variability genotypic coefficient:

The phenotypic coefficient of variability (P.C.V) and the variability genotypic coefficient (G.C.V) intended conferring to Singh and Chaudhary (1977) by way of following:

P.C.V =($VF_2)^{0.5}$ /F_2 G.C.V = (VF_2 -VE)$^{0.5}$ /F_2.

RESULTS AND DISCUSSION

Means all six populations studied characteristics table 2 variance analysis shows significant differences between population six tools for most of the traits studied. The results showed that it was higher in all qualities compared with P1 P2 all crosses, while crossing means parents give different values from one to another of the traits studied. Difference in means which might suggest disparities.

The table is displayed (3) measurement results of tests (a, b, c) and Study of the interaction of genes not allelic to all traits in three crosses, except the number of pods per plant and seed yield per plant at first by the same results with EL- Refaey (1999), also Attia and Salem (2006) and Al-Fahady (2009)

Table 3 estimated genetic effects in six parameter model. Crucial to estimated values of Antiquities mean (m) indicated that all characters studied inherited quantitatively. Additive gene effects (d) all important qualities in all crosses except the plant height per second across all branches, the second cross station, number of pods per plant in the first cross. Gene effects of dominance was found to be too big for plant height, number of branches, number of pods per plant, 100 seed weight and seed yield / plant except days to maturity on the first cross. The effects of Genetic were added (d) with regard to the effects of the corresponding dominance (h) and in most cases, suggesting a useful breeding programme pedigree selection method to expand this

Table 2. Mean performance and standard error of parents, F_1 , F_2 and backcrosses populations for all the studied traits in faba bean.

Traits populations	Maturity 90%	Plant height	Branches No./ plant	Pods No. /plant	100-seed weight	Seed yield/plant
Cross 1 (Giza x Giza)						
P_1	147.445±0.214	121.44±0.698	2.55±0.022	22.122±0.542	58.448±0.543	29.342±0.496
P_2	152.555±0.267	116.75±0.689	5.44±0.033	31.112±0.612	60.124±0.583	35.345±0.673
F_1	148.224±0.278	155.55±0.677	5.65±0.53	38.444±0.712	77.987±0.474	40.234±0.615
F_2	152.156±0.367	141.5±1.226	4.02±0.088	33.234±1.233	77.616±1.016	33.334±1.212
BC_1	145.235±0.255	146.16±0.892	3.25±0.044	35.612±0.892	65.235±0.657	37.878±0.755
BC_2	159.116±0.248	140.42±0.818	5.35±0.046	36.733±0.815	71.525±0.717	38.423±0.785
L.S.D at 5%	3.154	5.556	1.116	5.022	9.118	6.119
Cross 2 (Giza x Giza)						
P_1	150.335±0.294	126.98±0.501	1.95±0.065	18.654±0.565	45.985±0.612	20.234±0.589
P_2	155.985±0.256	116.41±0.666	5.15±0.085	28.455±0.723	59.543±0.547	30.457±0.767
F_1	151.122±0.267	150.33±0.757	5.99±0.078	38.855±0.522	65.434±0.677	40.123±0.578
F_2	155.454±0.422	138.88±1.333	4.01±0.125	25.775±1.116	60.333±1.113	27.673±1.175
BC_1	148.125±0.256	142.44±0.817	4.85±0.098	23.554±0.825	49.988±0.845	25.454±0.756
BC_2	157.234±0.245	138.11±0.912	5.14±0.094	28.228±0.786	55.878±0.732	30.346±0.657
L.S.D at 5%	3.014	8.589	1.212	5.115	8.775	5.558
Cross 3 (Giza x Giza)						
P_1	145.135±0.267	125.46±0.456	2.01±0.044	27.445±0.612	54.986±0.576	24.896±0.625
P_2	159.444±0.211	119.25±0.953	4.75±0.054	40.234±0.718	62.767±0.675	36.238±0.575
F_1	152.112±0.282	149.56±0.765	5.01±0.066	44.125±0.677	76.895±0.578	41.016±0.589
F_2	155.784±0.378	140.22±0.999	4.72±0.098	36.254±1.111	74.339±0.999	32.765±1.009
BC_1	151.345±0.258	141.22±0.676	4.18±0.063	38.545±0.892	62.234±0.708	35.234±0.765
BC_2	154.446±0.252	137.33±0.479	4.65±0.065	39.965±0.786	68.958±0.695	36.345±0.675
L.S.D at 5%	3.116	9.654	1.312	4.325	9.025	6.665

Table 3. Scaling test and gene action for all studied traits using 6 populations in three faba bean crosses during winter season 2014/2015.

Traits populations	Maturity 90%	Plant height	Branches No. / Plant	Pods No. /plant	Weight of 100-seed	Seed yield par plant
			Cross 1 (Giza x Giza)			
A	-5.20**	15.33**	-1.70**	10.66**	-5.97**	6.18**
B	17.45**	8.54**	-0.39**	3.91*	4.94**	1.27
C	12.18**	16.71**	-3.21**	2.81	35.92**	-11.82**
M	152.16**	141.50**	4.02**	33.23**	77.62**	33.33**
D	-13.88**	5.74**	-2.10**	-1.12	-6.29**	-0.55
H	-1.70	43.62**	2.78**	23.58**	-18.24**	27.16**
I	0.08	7.16	1.12**	11.75*	-36.94**	19.27**
J	-11.33**	3.40*	-0.66*	3.37*	-5.45*	2.46
L	-12.33**	-31.03**	0.97	-26.32**	37.97**	-26.71**
			Cross 2 (Giza x Giza)			
A	-5.21**	7.57**	1.76**	-10.40**	-11.44**	-9.45**
B	7.36**	9.48**	-0.86**	-10.85**	-13.22**	-9.89**
C	13.25**	11.47**	-3.04**	-21.72**	4.94*	-20.25**
M	155.45**	138.88**	4.01*	25.78**	60.33**	27.67**
D	-9.11**	4.33	-0.29	-4.67**	-5.89*	-4.89*
H	-13.14**	34.22**	6.38**	15.77**	-16.93**	15.69**
I	-11.10**	5.58	3.94**	0.46	-29.60**	0.91
J	-6.28**	-0.96	1.31	0.23	0.89	0.22
L	8.94**	-22.63**	-4.84**	20.79**	54.26**	18.43**
			Cross 3 (Giza x Giza)			
A	5.44**	7.42**	1.34*	5.52**	-7.41**	4.56*
B	-2.66**	5.85**	-0.46*	-4.43*	-1.75	-4.56*
C	14.33**	17.05**	2.1*	-10.91*	25.81**	-12.11**
M	155.78**	140.22**	4.72**	36.25**	74.34**	32.77**
D	-3.10*	3.89**	-0.47*	-1.42	-6.72*	-1.11
H	-11.73**	23.43**	0.41**	22.29**	-16.95**	22.55**
I	-11.55**	-3.78	-1.22	12.00*	-34.97**	12.10*
J	4.05	0.785	0.90**	4.98**	-2.83*	4.56*
L	8.78**	-9.49**	0.34	-13.10**	44.13**	-12.09**

Largely positive of additive x additive epistatic gene effects of type (I) maturity days detected 90% in the third cross, number of branches per second across, plant height per second across a number of pods per plant in the first over and seed yield per plant in the first one, while negative for several days to maturity of 90% at the first cross, number of branches in the third cross, in plant height. Additive × dominance of epistatic gene effects (j) type was found to be significant for all traits in all crosses examined, except on days to maturity in the third cross and plant height in two and three crosses, number of branches in the third cross, a number of centuries every station in the second cross, 100 seed weight per second across and seed yield / plant

X's dominance was found dominance of epistatic gene effects type (L) to be significant for all traits in all crosses examined, except for plant height in the first and third crosses, and it played a major role in inheriting all traits studied. (H) and (l) the interview if days to maturity in two crosses, crosses the plant height in three, number one, cross sections and reflects the number of pods per plant, 100 seed weight in three crosses and seed yield per plant in two crosses, indicating the duplicate type of interaction is allelic in these qualities.

And controls inherit all traits examined genetic and non-additive effects. Get more value from the influence of genes dominate one in most cases. Among other elements added impact can be solved, any additive x additive (I) type of interaction, and was also great and constitute a large part of the effects of genes, therefore, it may be possible to exploit it by El- Deeb *et al*.,(2008) , Abo -Mostafa *et al*., (2014) and Ismail *et al*., (2015). Darwish *et al*. (2005), Attia *et al*., (2002) , Attia (2007) and El-Hady *et al*. (2008) Found a preponderance of genetic work is added in the inheritance of bean bean yield per plant and the majority of its elements. El-Deeb *et al*., (2008), Mention that when additive effects are larger than non-additive, suggesting that selection in early generation be effective separation, while, if added part of additives improve the characters that need intensive selection through the latest generation, when the epistatic effects important for attributes, access to separate desirable through intermarriage between the early generations. El- Hady *et al*. (1998), Al-Fahady (2009), Abo-Mostafa *et al*., (2014) and Ismail *et al*., (2015) According to the predominance of additive × dominance of epistatic effect of higher size attribute indicates delayed choice and inter-mating isolates, followed by repeated selection to improve these attributes heterosis, inbreeding depression (%), morphometric (PVC) explained (GVC) coefficient of variation and genetic progress in three bean bean expresses all traits studied table (4). Hitirosis found for original mid-original and best to be largely positive for plant height, number of branches per plant, number of pods per plant and weight 100-essd and crop seeds in three crosses, while it was negative for accrual days 90% in three crosses. These consequences are in agreement per those obtained by El-Hossary *et al*., (1986), El-Hossary (1987), El-Hossary and Sedhom (1988), Hendawy *et al*., (1988) and Hendawy *et al*., (1994) and Al-Fahady (2009). With regard to depression Stud, has been getting very positive and significant values for plant height in two crosses, each station branches in two crosses, crosses a number of pods per plant in three, 100-seed weight in one cross and seed yield per plant in three crosses, however, was largely negative for several days to maturity 90% in three crosses. Accidentally discovered a sign and size of hitirosis depression Stud for most traits in three crosses bean bean. This logic and due to express hitirosis in F1 will be followed by a contradiction between hitirosis and depression Stud for a number of pods per plant, weight 100-seed and seed yield per plant could be the result of a link between the genes in the plant material. Faba bean has a moderately squat inbreeding sadness, by Bond (1966), Hendawy *et al*., (1994) and Ismail *et al*., (2015).

Phenotypic coefficient (PVC) higher values of variability (GVC) for all three traits in (Table 5) reflect. The results indicated also that the PVC values and GVC lot nearby, revealed that contributed a large proportion of variation in genetic factors on genetic variation in most of the phenotypic coefficient values and volatility. Consequently, these high qualities of environmental factors. This indicates high gain genetic, suggesting a possible role of gene effects added to these qualities. These results are in harmony with those obtained by Attia and Salem (2006), El- Deeb *et al*.,(2008) and Haridy *et al*., (2012). These informations of great improving for breeders of faba bean to increase yield prospective and statement a new faba genotypes.

Table 4. Heterosis, inbreeding depression(%) and (PCV) and (GCV) in three faba bean crosses for all studied traits.

Characters	Crosses	Heterosis		Inbreeding depression	(P.C.V)	(G.C.V)
		M . P	B . P			
Maturity 90%	Cross 1	-1.18*	-2.84**	-2.65**	2.64	2.48
	Cross 2	-1.33**	-3.12**	-2.87**	2.97	2.81
	Cross 3	-0.12	-4.60**	-2.41**	2.66	2.50
Plant height	Cross 1	30.61**	33.23**	9.03**	9.49	9.11
	Cross 2	23.53**	29.14**	7.62**	10.51	10.20
	Cross 3	22.23**	25.42**	6.25*	7.81	7.23
No. of branches/ Plant	Cross 1	41.43**	3.86	28.85**	23.98	23.41
	Cross 2	68.73**	16.31**	33.06**	34.15	32.40
	Cross 3	48.23**	5.47*	5.79*	22.74	21.82
No. of pods/plant	Cross 1	44.43**	23.57**	13.55**	40.64	39.31
	Cross 2	64.96**	36.55**	33.66**	47.43	45.63
	Cross 3	30.40**	9.67*	17.84**	33.57	32.01
100-seed weight	Cross 1	31.54**	29.71**	0.48	14.34	13.83
	Cross 2	24.01*	9.89	7.80**	20.21	19.42
	Cross 3	30.60*	22.51**	3.32*	14.72	14.02
Seed yield/plant	Cross 1	24.40*	13.83*	17.15**	39.83	38.59
	Cross 2	58.30**	31.74**	31.03**	46.51	44.70
	Cross 3	34.18**	13.19*	20.12**	33.73	32.23

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تقدير القياسات الوراثية باستخدام العشائر الست في الفول البلدي

مختار حسن هريدى و محمد عبد العزيز محمد السيد
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أجريت هذه الدراسة بمزرعة الأزهر بأسيوط التابعة لكلية الزراعة جامعة أسيوط خلال المواسم الزراعية الثلاثة ٢٠١٣و٢٠١٤و٢٠١٥ باستخدام خمسة أباء من الفول البلدي وتم تكوين ثلاثة هجن وهى الهجين الأول (جيزة ٤٢٩x جيزة ٦٧٤) و (جيزة ٤٠ x جيزة ٤٠٢) و (مصر ١ x جيزة ٦٧٤) وعند الإزهار تم عمل التهجينات المطلوبة بينها للحصول على بذور الجيل الأول لكل هجين ثم زرعت حبوب الآباء والجيل الأول الهجين في الموسم الزراعي الثاني وتم التهجين بينهما وبين الآباء للحصول على حبوب الهجين الرجعى الأول لكل أبوين وكذلك تم عمل التهجين الذاتي للجيل الأول للحصول على حبوب الجيل الثاني لكل هجين. وفى الموسم الثالث ٢٠١٥ تم زراعة التجربة في تصميم القطاعات كاملة العشوائية فى ثلاث مكررات تشمل عشائر الآباء والجيل الأول والجيل الثاني والجيلين الرجعيين للآباء. وتم تحليل النتائج المتحصل عليها لصفات: عدد الأيام حتى النضج وطول وعدد التفريعات وعدد القرون و وزن ١٠٠ بذرة ومحصول النبات أوضحت النتائج ما يلي: ١- أظهرت النتائج وجود اختلافات معنوية بين التراكيب للآباء المستخدمة في الهجن لمعظم الصفات المدروسة.٢- أشارت النتائج أن توارث كل الصفات المدروسة كان محكوما بالفعل الجيني من النوع المضيف وغير المضيف مع تأثير أعلى للجينات السائدة عن الجينات الإضافية في معظم الحالات وقد ظهر مابين التأثيرات غير المضيفة خليط من المكونات منها تأثير تفاعل المضيف x المضيف (i) حيث أيضا كان معنويا وكان تأثير السيادة (h) متضاد مع تأثير السائد x السائد (L) في صفات عدد الأيام حتى النضج في هجينين وطول النبات ثلاثة هجن وعدد التفريع للنبات في هجين واحد وعدد القرون للنبات في هجينين و وزن ١٠٠ بذرة في ثلاثة هجن ومحصول النبات في هجينين مما يوحى بتأثير مزدوج للتفاعلات غير أليلية لهذه الصفات وكذلك فان تأثير الجينات من النوع المضيف x السائد (j) كان أيضا معنويا لكل الصفات المدروسة ماعدا عدد الأيام حتى النضج في الهجين الثالث وطول النبات في الهجين الثاني والثالث وعدد التفريع للنبات في الثاني والثالث وعدد القرون للنبات في الهجين الثاني ووزن ١٠٠ بذرة في الهجين الثاني و محصول النبات في الهجن الأول والثاني . ٣- أوضحت النتائج أن تأثير الجينات من النوع السائد x السائد تأثير معنويا في توارث كل الصفات كما لوحظ إن تأثير جينات الإضافة كان اقل نسبيا من تأثير جينات السيادة في معظم الحالات مما يزيد من أهمية الانتخاب بطريقة تسجيل النسب كبرنامج تربية لتحسين هذه العشائر.٤- لوحظ تضاد نتائج قوة الهجين والتربية الداخلية فى معظم الصفات لكل الهجن المدروسة.