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Relative Efficiency of Selection for Yield and Some Related Characters in Some Populations of Grain Sorghum (*Sorghum bicolor* L. Moench)

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Abstract

The present study was carried out at the Experimental Research Farm of the Faculty of Agriculture, Sohag University at El-Kawthar Town, Sohag Governorate, Egypt during the 2022 and 2023 summer growing seasons. The breeding material used in this study were F_2 and F_3 families from one cross of sorghum, *i.e.*, Dorado × Giza-15 (pop.). The objectives were to assess the relative efficiency of selection methods for improving grain yield/ plant and correlated traits. Highly significant differences among F_2 and F_3 families satisfactory genotypic coefficient of variability and large magnitude of broad sense heritability were obtained for all studied traits. In two generations, grain yield/plant showed positive highly significant correlations with all studied traits. The results showed high genetic advance as a percentage of the mean (GAM %) for all studied traits in the two generations (F_2 and F_3) except for days to 50% flowering which was moderate. Direct selection for grain yield/ plant increased by 19.74 % from the bulk sample after one cycle of selection. This increase was accompanied by an increase in plant height (3.41%) and 1000–grain weight (18.90%), a favorable decrease in days to 50 % flowering (-0.81 %). The best-given family after one cycle of selection was Family No. 50 which out-yielded the bulk sample by 82.15% for grain yield/plant and by 52.15% for 1000 grain-weight.

Keywords: Heritability, Selection, (GAM%)

INTRODUCTION

The success of a crop improvement program depends on the amount of genetic variation available and its use. Although many sorghum (*Sorghum bicolor* (L.) Moench) breeders have successfully applied traditional breeding methods, the genetic potential has not been fully exploited and yields are still below theoretical maximum values. One reason is that the amount of genetic variation exploited by traditional breeding methods is limited. (Hunt *et al.* 2018). Plant breeders are continuously searching for more effective and efficient selection procedures for crop improvement. Numerous procedures have been proposed but only a few valid comparisons have been made between alternative procedures *i.e.* Bernardo (2010), and Crossa *et al.* (2010). The practical value of a plant is affected by several traits. Selection for yield components can be an effective way to improve the grain yield of a population. Heffner *et al.* (2010) concluded that individual yield components might contribute value information in breeding for yield. Kebede *et al.* (2019) reported that selection was effective in improving grain yield, but it was associated with an undesired increase in plant height and late flowering. Ali (2002) indicated an increase in grain yield/plant, earlier flowering, shorter plants, and heavier grains after two cycles of pedigree selection for grain yield/plant. Ali *et al.* (2006) reported that selection for grain yield/plant was effective in improving populations. In addition, they reported that there were positive and significant correlations between grain yield/plant and 1000-grain weight. The objective of this study was to assess the relative efficiency of selection techniques for improving grain yield and its components in the grain sorghum population.

MATERIALS AND METHODS

The present study was carried out at the Experimental Research Farm of the Faculty of Agriculture, Sohag University at El-Kawthar Town, Sohag Governorate, Egypt during the 2022 and 2023 summer growing seasons. The breeding materials used in this study were 106 F_3 Sorghum (Sorghum bicolor L. Moench) families traced back to random F_2 plants from one cross, Dorado × Giza - 15 (pop.). The main characters of the parents were described by Sorghum Res. Section, Agric. Res. Station, Sohag, Egypt (Table 1). In the 2022 growing season, the 106- F_2 Families from the F_1 population, (F_2 - bulked sample of an equal number of seeds from each F_2 plant to present the generation mean) and the two parents of the population were sown at Sohag on the 12th July in an experiment in a randomized complete block design with two replications. The experimental plot was one ridge, four meters long and 60 cm. apart and the sowing was done with 20 cm. between hills, two plants/hill. The recommended cultural practices were adopted throughout the growing season.

Table (1):- Description of the studied agronomic characterizations for parental genotypes.

Parents	Origin	Characters			
		Days to 50 % flowering	Plant height, cm	Grain yield/ plant, gm	1000-grain weight gm
Dorado	ICRISAT (India)	74	160	66.70	38.70
Giza 15	ARC (Egypt)	68	355	80.40	51.80

The following traits were measured on one selected plant per plot:

1- Days to 50 % flowering: Number of days from the sowing date until 50 % of the plant shade its pollen grains.
2- Plant height (cm): Measured from the soil surface to the top of the panicle.
3- Grain yield /plant (gm): one guarded plant was harvested, threshed, and grains were cleaned and weighed. The average grain weight per plant was calculated.
4- 1000-grain weight (gm): One thousand grains were counted, weighed, and recorded in grams.

The 106 best plants from the 106 families in the populations based on (the selection criterion grain yield/plant) were saved to give F_3 families. In the 2023 growing season, 106 F_3 families along with the parents and F_3-bulk sample were sown on

15th July in one experiment. The experimental design was a randomized complete block design with two replications. Plot size was one ridge, 6 m long, 60 cm apart, and 20 cm between hills within a ridge. Data were recorded for the mentioned traits.

Statistical analysis:-

The analysis of variance and covariance was performed as outlined by Singh and Chauudary (1985). The phenotypic (PCV %) and genotypic (GCV %) coefficient of variability were estimated using the formula developed by Burton and de Vane (1953). Phenotypic correlation and heritability in a broad sense were calculated as outlined by Walker (1960). Genetic Advance as a percentage of the mean (GAM) assuming the selection of a superior 5% of the genotypes was estimated by the methods illustrated by Johnson *et al.* (1955). The observed gain as the difference between a mean of the selected families and random bulk sample value was tested using the revised CD method.

RESULTS AND DISCUSSION

Means and variances:-

Analysis of variance (Table 2) for the populations (F_2 and F_3 families) indicates highly significant differences among families for all studied traits in the two generations, indicating that selection in these families could be effective. These results are confirmed by the genotypic coefficient of variability and phenotypic coefficient of variability (Table 3). Genetic variability in the two generations (F_2 and F_3) is due to the genetic diversity among the crossed parents. For example, Dorado flowered after 74 days while Giza-15 flowered after 68 days from sowing. Plant height varied from 160 cm for Dorado to 355 cm for Giza-15. Grain yield/plant varied from 66.70 gm., for Dorado to 80.40 gm., for Giza-15. 1000-grain weight varied from 38.70 gm., for Dorado to 51.80 gm., for Giza-15. The characteristics of the start populations have a considerable effect on early generation selection. The slight discrepancy between (PCV%) and (GCV%) resulted in high estimates of broad sense heritability for all studied traits. Greater response to selection could be expected in the two generations having greater genotypic and phenotypic variances. Burton and de Vane (1953) and Crossa *et al.* (2011) reported that a genetic coefficient of variation together with a heritability estimate only would seem to give the best picture of the amount of the genetic advance expected from selection. This conclusion is based on the notation developed by Ali *et al.* (2006) and Bernardo (2010). In the same direction, high genetic advance as a percentage of the mean (GAM %) was observed for all studied traits in the two generations (F_2 and F_3) except for days to 50% flowering it was moderate. High genetic advance along with high heritability estimates indicated the predominance of additive genes, and early selection may be effective for these traits. Endalamaw *et al.* (2019) and Jafar *et al.* (2023), observed high GAM% values for days to 50% flowering and grain yield/plant.

Table (2): - Mean Squares for the studied traits of the F_2 and F_3 Families.

S.O.V	d.f	Mean Square F_2 Families (Season 2022)			
		Days to 50% Flowering (days)	**Plant Height (cm)**	**Grain Yield / Plant (g)**	**1000 Grain Weight (g)**
Reps	1	26.53	0.005	175.72	0.70
Families	105	62.23**	5,137.90**	207.23**	94.44**
Error	105	2.01	2.77	1.27	1.006
Mean Square F_3 Families (Season 2023)					
Reps	1	1.36	6.11	0.04	13.50
Families	105	41.27**	4,738.04**	194.28**	56.64**
Error	105	2.23	4.07	3.94	9.70

*, ** Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.

Table (3): - Means, phenotypic (PCV%), genotypic (GCV%) coefficient of variability, genetic advance as a percentage of the mean (GAM), and heritability in a broad sense for the studied traits in the F_2 and F_3 Families.

Items	Season 2022			
	Days to 50% Flowering (days)	Plant Height (cm)	Grain Yield / Plant (g)	1000 Grain Weight (g)
P_1 (Dorado)	75.50	151.50	63.05	31.15
P_2 (Giza - 15)	65.50	316.50	75.85	48.90
F_2 Bulk	72.50	237.50	43.15	30.22
F_2 Families	71.13	209.80	56.15	36.66
PCV %	7.84	24.16	18.13	18.74
GCV %	7.71	24.15	18.07	18.64
GAM	15.63	49.74	37.12	38.20
h^2 % Broad Sense	96.77	99.95	99.39	98.94
Season 2023				
P_1 (Dorado)	78.50	159.00	62.15	36.55
P_2 (Giza - 15)	70.50	327.50	81.35	45.30
F_3 Bulk	74.00	200.50	46.95	32.70
F_3 Families	73.40	207.33	56.22	38.88
PCV %	6.19	23.48	17.53	13.69
GCV %	6.09	23.47	17.35	12.46
GAM	12.06	48.32	35.38	23.37
h^2 % Broad Sense	94.60	99.91	97.97	82.87

Phenotypic simple correlations:-

Estimates of the phenotypic correlation among all possible pairs of the four traits studied in the two generations (F_2 and F_3 families) are shown in Table (4). The phenotypic simple correlation among grain yield/plant and each of 1000-grain weight, and days to 50% flowering were positive and highly significant (0.48 and 0.16) in F_2 families, respectively, but it was very weak and negative with plant height. Otherwise, in F_3 families, grain yield/plant showed a highly positive and significant correlation with 1000-grain weight (0.36), plant height (0.16), and days to 50% flowering (0.28). Derese *et al.* (2018) reported that grain yield/plant was positively and significantly correlated with panicle length, panicle width, and 1000-grain weight. However, Narkhede *et al.* (2017) found positive and significant correlations with panicle length, panicle width, and 1000-grain weight but weak correlations between grain yield/plant, plant height, and days to 50 % flowering. They also stated that selection for yield alone resulted in lines with increased height and days to 50% flowering. These results are in line with those reported by Ali *et al.* (2006) and Akatwijuka *et al.* (2019).

Table (4):- Phenotypic correlation coefficient between pairs of traits in F_2 and F_3 generations.

Traits	Season 2022 F_2 Families		
	Days to 50% Flowering (days)	Plant Height	Grain Yield/Plant
Plant Height	0.31**	--	
Grain Yield/Plant	0.16**	-0.08	--
1000 Grain Weight	0.38**	0.27**	0.48**
Season 2023 F_3 Families			
Plant Height	0.23**	--	
Grain Yield/Plant	0.28**	0.16**	--
1000 Grain Weight	0.37**	0.27**	0.36**

*, ** Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.

Heritability estimation: -

Estimates of broad sense heritability after the first selection cycle (C_0 to C_1) were high in all studied traits except 1000-grain weight (82.87). These results are in the same direction as those reported by Maulana *et al.* (2023) who indicated that heritability estimates for grain yield increased from C_0 to C_4. Endalamaw and Zigale (2020) reported that broad sense heritability for blooming date, yield, and grain weight were high in all populations.

Realized and correlated response to selection:-

The results in Table (5) showed that direct selection for grain yield/ plant increased by 19.74 % from the bulk sample after the first cycle of selection. This increase was accompanied by an increase in plant height (3.41%) and 1000–grain weight (18.90%), a favorable decrease in days to 50 % flowering (-0.81 %). These results go in the same way as the findings of Ali *et al.* (2006) and Maulana *et al.* (2023).

Table (5):- Observed gain of selection measured in percentage from the bulk sample of F_2 and F_3 Families.

Cycle No.	Days to 50% Flowering (days)	Plant Height (cm)	Grain Yield / Plant (g)	1000 Grain Weight (g)
C_0 (F_2)	-1.89	-11.66	30.13	21.31
C_1 (F_3)	-0.81	3.41	19.74	18.90

Means of the selected families:-

One cycle of direct selection for grain yield/plant inside F_2 families resulted in the given family (No. 50) in Table (6) which yielded the bulk sample by 82.15%, 1000-grain weight by 52.15 %, and a favorable decrease by -5.40% days to 50% flowering. These findings are in agreement with those reported by Ali *et al.* (2006) and Jafar *et al.* (2023).

Table (6):- Families means after the first cycle of selection:-

Families No.	Days to 50% Flowering (days)	Plant Height (cm)	Grain Yield / Plant (g)	1000 Grain Weight (g)
Fam 1	71.00	130.50	66.95	39.93
Fam 2	70.00	193.50	56.70	38.68
Fam 3	72.50	213.50	49.35	32.43
Fam 4	68.50	136.50	57.30	39.78
Fam 5	71.50	211.00	57.35	44.28
Fam 6	82.50	255.00	75.10	30.93
Fam 7	73.00	279.00	54.25	41.73
Fam 8	69.50	184.50	51.15	38.28
Fam 9	71.50	159.50	40.40	34.93
Fam 10	69.00	241.50	52.75	41.73
Fam 11	73.50	247.50	61.00	38.33
Fam 12	75.00	283.00	48.35	34.43
Fam 13	71.00	181.50	54.65	30.83
Fam 14	67.00	238.50	49.10	39.23
Fam 15	74.50	256.00	63.30	41.33
Fam 16	75.50	202.50	39.65	38.73
Fam 17	73.50	249.00	49.40	36.83
Fam 18	75.50	167.50	40.50	31.98
Fam 19	72.00	135.50	49.95	38.73
Fam 20	75.50	202.50	56.95	44.13
Fam 21	71.50	127.50	57.15	38.03
Fam 22	70.00	148.00	58.50	38.08
Fam 23	79.50	226.50	58.70	43.38
Fam 24	75.00	177.50	53.70	39.43
Fam 25	79.50	260.00	69.40	48.48
Fam 26	65.50	146.50	49.75	38.03
Fam 27	57.50	181.00	54.25	29.53
Fam 28	70.50	208.50	49.80	40.63
Fam 29	75.00	196.50	47.30	30.33
Fam 30	75.50	163.00	41.15	31.48
Fam 31	59.50	165.50	43.05	24.38
Fam 32	64.00	187.50	42.25	31.03
Fam 33	70.50	217.00	44.40	27.88
Fam 34	79.00	267.50	40.55	34.18
Fam 35	79.00	280.00	78.70	48.43
Fam 36	68.00	213.00	65.75	34.43
Fam 37	68.50	226.00	59.25	31.88
Fam 38	72.50	266.50	40.10	31.98
Fam 39	74.50	152.50	55.20	40.68
Fam 40	72.50	141.50	59.75	46.98
Fam 41	81.00	217.50	63.85	46.53
Fam 42	69.50	226.00	48.50	37.83
Fam 43	77.50	155.50	57.05	34.68
Fam 44	78.50	279.50	60.75	45.73
Fam 45	77.00	312.50	34.60	34.93
Fam 46	81.50	298.00	76.50	48.48
Fam 47	74.50	213.50	64.85	38.58
Fam 48	74.00	266.50	63.00	40.58
Fam 49	71.50	204.00	54.20	36.63
Fam 50	70.00	269.50	78.60	45.98
Fam 51	71.00	274.00	44.25	37.08
Fam 52	68.00	283.00	63.10	37.88
Fam 53	76.50	260.00	68.35	41.88
Fam 54	76.50	271.50	77.60	47.18
Fam 55	77.50	107.50	54.70	41.23
Fam 56	72.50	151.00	51.80	39.68
Fam 57	78.00	180.00	51.80	38.08
Fam 58	76.50	192.50	62.85	42.98
Fam 59	70.50	145.50	66.95	41.53
Fam 60	74.00	128.50	60.10	39.63
Fam 61	77.50	193.50	54.20	39.78
Fam 62	75.00	282.00	62.25	46.73
Fam 63	69.50	173.50	52.85	43.48
Fam 64	74.50	253.50	50.20	36.83
Fam 65	73.50	249.00	44.30	35.23
Fam 66	75.50	139.50	55.00	38.33
Fam 67	72.00	199.00	36.25	47.73
Fam 68	70.50	240.50	48.35	37.88
Fam 69	70.50	209.00	51.60	40.53
Fam 70	74.50	158.50	64.95	31.03
Fam 71	75.00	181.50	57.15	37.73
Fam 72	69.50	111.00	66.75	37.48
Fam 73	70.50	199.50	57.90	34.03
Fam 74	78.00	233.50	47.75	41.68
Fam 75	70.50	146.50	71.65	36.38
Fam 76	76.00	231.00	73.10	44.48
Fam 77	83.00	247.00	57.35	45.33
Fam 78	69.00	217.50	54.85	34.43
Fam 79	69.50	144.50	48.90	37.93
Fam 80	72.50	186.50	42.40	33.93
Fam 81	63.50	216.00	47.75	36.68
Fam 82	71.50	222.50	60.95	45.18
Fam 83	73.00	246.50	48.75	43.68

Families No.	Days to 50% Flowering (days)	Plant Height (cm)	Grain Yield / Plant (g)	1000 Grain Weight (g)
Fam 84	70.50	274.00	46.65	38.58
Fam 85	77.50	164.50	59.75	34.08
Fam 86	79.00	129.00	46.55	33.73
Fam 87	77.50	204.00	52.50	44.58
Fam 88	69.00	234.00	55.55	33.48
Fam 89	74.50	260.00	54.65	41.03
Fam 90	79.50	277.50	73.75	44.73
Fam 91	67.50	171.50	55.70	32.88
Fam 92	74.50	192.50	70.10	34.53
Fam 93	77.00	141.00	46.85	38.58
Fam 94	70.00	183.50	47.05	42.18
Fam 95	76.50	279.50	72.10	43.63
Fam 96	76.50	237.00	66.30	42.98
Fam 97	78.00	212.50	59.90	45.08
Fam 98	81.50	212.00	71.40	41.48
Fam 99	71.00	227.50	55.05	44.78
Fam 100	72.00	158.50	50.55	40.73
Fam 101	72.00	139.00	61.35	23.08
Fam 102	79.50	149.00	56.25	35.83
Fam 103	79.50	230.50	62.70	49.18
Fam 104	77.50	224.50	64.10	41.43
Fam 105	71.50	226.50	68.85	41.88
Fam 106	78.50	211.50	59.90	42.83

Table (6) continue

Families No.	Days to 50% Flowering (days)	Plant Height (cm)	Grain Yield / Plant (g)	1000 Grain Weight (g)
Mean	**73.40**	**207.33**	**56.22**	**36.66**
Bulk	**74.00**	**200.50**	**43.15**	**30.22**
CD $_{0.05}$	2.93	3.95	3.89	6.10
CD $_{0.01}$	3.84	5.18	5.10	8.00

CONCLUSION

The results herein indicated that the genetic coefficient of variability decreased after the first cycle of selection. High genetic advance along with high heritability estimates indicated the control of additive gene effect for that the early selection may be effective for improving the performance of characters. The relative efficiency of single trait selection indicated that it was an effective procedure for improving the tested traits in early generations (F_2 and F_3 families). One cycle of selection increased grain yield/plant by 19.74 % from the bulk sample.

REFERENCES

Akatwijuka R., P.R. Rubaihayo and T.L. Odong (2019). Correlations and Path Analysis of Yield Traits in Sorghum Grown in Southwestern Highlands of Uganda. African Crop Science Journal, Vol. 27, No. 3, pp. 437 – 444. DOI: https://dx.doi.org/10.4314/acsj.v27i3.8.

Ali H.I., M.A. Ali and K.M. Mahmoud (2006). Pedigree selection for yield in grain sorghum population (*Sorghum bicolor* (L.).

Ali. H.I. 2002. Selection for drought tolerance in two-grain sorghum (*Sorghum bicolor* (L.) Moench). Ph. D. Thesis, Fac. Agric. Assiut Univ., Egypt.

Bernardo R. (2010). Breeding for quantitative traits in plants (Wood bury, MN: Stemma Press).

Burton G.W. and E.H. de Vane (1953). Estimating heritability in Tall Fescue (*Festuca-arundinacea*) from replicated clonal material. Agron. J. 45: 481-487.

Crossa J., G. De Los Campos, P. Peírez, D. Gianola, J. Burguenao, J.L. Araus, *et al.* (2010). Prediction of genetic values of quantitative traits in plant breeding using pedigree and molecular markers. Genetics 186, 713–724. doi: 10.1534/genetics.110.118521.

Crossa, J., Peírez, P., de los Campos, G., Mahuku, G., Dreisigacker, S., and Magorokosho, C. (2011). Genomic selection and prediction in plant breeding. J. Crop Improv. 25, 239–261. doi: 10.1080/15427528.2011.558767.

Derese, S. A., H. Shimelis, L. Mwadzingeni, and M. Laing (2018). Agro-morphological characterization and selection of sorghum landraces. Acta Agriculturae Scandinavica, Section B - Soil & Plant Science, 68 (7), 585–595. https://doi.org/10.1080/09064710.2018.1448884.

Endalamaw, C., and S. Zigale (2020). Genetic variability and yield performance of sorghum (*Sorghum bicolor* (L.) Moench) genotypes grown in semi-arid Ethiopia. International Journal of Advanced Biological and Biomedical Research 8(2): 193-213.

Endalamaw, C., H. Mohammed and A. Adugna (2019). Genetic variability and performance in agronomic and quality traits in sweet sorghum (*Sorghum bicolor* (L.) Moench) genotypes. Adv. Crop Sci. Tech., 7:45.

Heffner E.L., A.J. Lorenz, J. Jannink and M.E. Sorrells (2010). Plant breeding with genomic selection: Gain per unit time and cost. Crop Sci. 50, 1681–1690. doi: 10.2135/cropsci2009.11.0662.

Hunt C.H., F.A. Van Eeuwijk, E.S. Mace, B.J. Hayes and D.R. Jordan (2018). Development of genomic prediction in sorghum. Crop Sci. 58 (2), 690–700. doi: 10.2135/cropsci2017.08.0469.

Jafar M., B. Tesso and G. Mengistu (2023). Genetic variability, heritability, and genetic advance for quantitative traits of sorghum [*Sorghum bicolor* (L.) Moench] genotypes at Fedis, Eastern Ethiopia. Int J Agric Sc Food Technol 9(3): 064-075. DOI: 10.17352/2455-815X.000195.

Johnson H.W., H.F. Robinson and R.E. Comstock (1955). Estimates of genetic and environmental variability in soybeans. Agron. J., 47: 314-318.

Kebede T. Muleta, G. Pressoir, P.M. Geoffrey (2019). Optimizing Genomic Selection for a Sorghum Breeding Program in Haiti: A Simulation Study, G3 Genes|Genomes|Genetics, 9(2): 391–401, https://doi.org/10.1534/g3.118.200932.

Maulana F., R. Perumal, D.D. Serba and T. Tesso (2023). Genomic prediction of hybrid performance in grain sorghum (*Sorghum bicolor* L.). Front. Plant Sci. 14:1139896. doi: 10.3389/fpls.2023.1139896.

Narkhede G. W., S. P. Mehtre, R. R. Jadhav and V. R. Ghuge (2017). Correlation and Path Analysis for Grain Yield, its Components and Drought Tolerance in Sorghum [*Sorghum bicolor* (L.) Moench], J. Agric. Res. Technol., 42 (3): 173-178.

Singh P.K. and S.D. Chaudhary (1985). Biometrical methods in quantitative genetics analysis. Kalyani New Delhi, India, pp: 318.

Walker J.T. (1960). The use of the selection index technique in the analysis of progeny row data. Emp. Cotton Gr. Rev. 37: 81- 107.

الكفاءة النسبية للانتخاب للمحصول و بعض الصفات المرتبطة به في بعض العشائر من ذرة الحبوب الرفيعة

جلال أحمد رزق الشربيني ، عبد الصبور جمال عبد الصبور خالد ، عمادالدين على ماهر و هدير سرحان عبدالغنى عبدالعزيز
قسم الوراثة – كلية الزراعة – جامعة سوهاج – سوهاج - مصر

الملخص العربى:

أجريت هذه الدراسة في مزرعة التجارب البحثية بكلية الزراعة بجامعة سوهاج بمدينة الكوثر – محافظة سوهاج – جمهورية مصر العربية في موسمين صيفيين متتاليين 2022 و 2023م. مواد التربية المستخدمة في هذه الدراسة هي عائلات الجيل الثاني و عائلات الجيل الثالث الناتجة من التهجين بين صنفي ذرة الحبوب الرفيعة دورادو و جيزة -15. كان الهدف من الدراسة هي تقدير الكفاءة النسبية لطرق بالانتخاب في تحسين محصول الحبوب و بعض الصفات المرتبطة به. أوضحت النتائج وجود إختلافات عالية المعنوية بين عائلات الجيل الثاني و عائلات الجيل الثالث و كذلك معدل مناسب من معامل التباين الوراثي (GCV%) بالإضافة الي مكافئ وراثي مرتفع لكل الصفات موضع الدراسة. كما أنه في كلا من الجيلين الذين تمت دراستهم أظهرت صفة محصول الحبوب ارتباط موجب عالي المعنوية مع كل الصفات التي تمت دراستها. كما أظهرت النتائج قيم مرتفعة من التقدم الوراثي كنسبة مئوية من المتوسط (GAM%) لكل الصفات المدروسة في كلا الجيلين (F_2 و F_3) ماعدا صفة عدد الأيام حتي 50% تزهير حيث أظهرت قيم متوسطة. الإنتخاب المباشر أدي لزيادة صفة محصول الحبوب بمقدار 19.74% عن محصول العينة التجميعية بعد دورة انتخابية واحدة، هذه الزيادة تلازمت معها زيادة في وزن 1000 حبة بمقدار 18.90% و زيادة في طول النبات بمقدار 3.41%، و كذلك نقص مفضل في عدد الأيام حتي 50% تزهير (تبكير) بمقدار 0.81%. كانت أفضل عائلة بعد دورة انتخابية واحدة هي العائلة رقم 50 و التي تفوقت في محصول الحبوب عن محصول حبوب العينة التجميعية بمقدار 82.15% و كذلك تفوقت في وزن 1000 حبة بمقدار 52.15%.