Egypt. J. Agric. Res., 80 (2), 2002.

GENETIC AND ENVIRONMENTAL VARIATION IN SEED YIELD AND ITS COMPONENTS, PROTEIN AND COOKING QUALITY OF LENTIL

HAMDI, A.[1]; SOMAYA, M. MORSY[2] AND E.M., EL-GHAREIB[3]

1 Field Crops Research Institute.

2 Food Technology Research Institute, Agricultural Research Center Giza, Egypt

3 Faculty of Agricultare, Al-Azhar University.

(Manuscript received Aug. 2001)

Abstract

This study aimed to investigate genetic and environmental effects on seed yield and seed quality characters of lentil. Eeight field experiments were carried out at four research stations in Egypt in 1997-98 and 1998-99 seasons with 24 diverse lentil genotypes. The studied characters were: seed yield (kg/fed), number of pods and seeds/plant, 100-seed weight, seed protein content, hydration coefficients of seeds before cooking (H.C.B.) and after cooking (H.C.A.) and seed cookability. There were highly significant differences between genotypes, locations and genotype x location interaction for all studied characters, with great environmental (location) effects. On the basis of the relatively high heritability, coefficient of genetic variation and genetic advance, pronounced progress should be expected from selection for 100-seed weight. Moderate progress from selection among genotypes should be expected with number of seeds/plant. However, lower genetic advance should be expected from selection among genotypes for seed yield, H.C.B., number of pods/plant and seed protein content.

INTRODUCTION

In Egypt, lentil *(Lens culinaris* Medikus*)* is considered the most important food legume crop after faba bean. As lentil is an important traditional dietary item throughout the country, yield and quality evaluation are considered important objectives in lentil breeding program. Protein content and cooking quality are two of the most important quality characters in the crop. On average, lentil provides more than twice the amount of dietary protein of cereals and its protein content is comparable to that of faba bean and higher than chickpeas (Abu-Shakra and Tannous, 1981). A range of seed protein of 18.6-30.2% was found when 1853 lentil accessions of the germplasm collection at ICARDA tested by Erskine and Witcombe (1984). In smaller tested lentil population, seed protein content in 34 lentil varieties ranged from 22.1 to 26.9% (Hamdi *et al.,* 1991). Highly significant differences among genotypes and genotype x environment interaction for seed protein content was reported by Hamdi (1987). He also found significant differences between genotypes and environments on seed protein quality using SDS-acrylamide gel electrophoresis.

El-Hashimy *et al.* (1985) reported that soaking and cooking significantly improved the protein quality of legumes. Erskine *et al.* (1985) found differences between locations in cooking time, but the range in cooking time was greater between genotypes than locations. Significant effects of seasons, environments, irrigation and locations on cooking time of lentil seeds were reported by Hamdi (1987).

This study aimed to investigate the genetic and environmental effects on seed yield and seed quality characters in lentil.

MATERIALS AND METHODS

The present investigation was carried out at four locations in Egypt varying widely in agro-ecological features. The locations are Nubaria, Gemmiza, Giza and Sids Research Stations of ARC in Egypt. The experiments were conducted during two successive winter seasons in 1997/1998 and 1998/1999. A total of 19 exotic and two local genotypes of lentil chosen at random, with consideration of diversity of origin and agronomic characteristics from the germplasm collection at Food Legume Research Section, Agricultural Research Center (ARC) were included in this Study. In addition, the wide spread Egyptian cultivars Giza 9 and Giza 370, and the new released variety Sinai 1 were included as checks. The description of all gnotypes is given in Table 1.

The following characters were measured: (1) Seed yield (kg/fed); (2) Number of pods/plant; (3) Number of seeds/plant; (4) 100-seed weight; (5) Percentage of seed protein content (calculated by multiplying the total nitrogen by 6.25 according to the method of A.O.A.C., (1990); (6) Hydration coefficient of seeds before cooking (H.C.B.); 10g of dry seeds from each experimental plot were soaked in tap water for 8h, then H.C.B was calculated as (weight of soaked seeds-weight of dry seeds) /weight of dry seeds) X 100; (7) Hydration coefficient of seeds after cooking (H.C.A.) was calculated by placing 10g of dry seeds from each experimental plot in 9 placed glass tube (100 cm3) containing enough water. The tubes were put in oven for 2 h at 100 ºC. The hydration coefficient after cooking (H.C.A.) was determined in cooked seeds according to the method of Fahmy *et al.* (1996) as follows: H.C.B.% =[(weight of cooked seeds- weight of dry seeds)/ weight of dry seeds] X 100; (8) Seed cookability (Coc %): The cookability of lentil seeds was measured by using the normal press of fingers to test the seed consistency. When 5 seeds were soft, more seeds were tested for softness until it had been verified that 80% of seeds were cooked. This cooking test was made according to the method described by Fahmy *et al.* (1996).

The statistical analysis of variance was performed separately for each enviro- ment in every year as a randomized complete block design (Gomez and Gomez, 1984). Components of variance and genotypic coefficient of variation, heritability in broad sense and expected genetic advance were calculated as suggested by Allard (1960).

RESULTS AND DISCUSSION

The individual analysis of variance for each location in every year showed signifi- cant differences among the tested genotypes with respect to all characters studied. Since Bartlett`s test indicated the homogeneity of experimental errors acros environ- ments, combined analysis of variance for the four locations was made for each year separately. Then the combined analysis of variance for all characters (except seed qual- ity characters) across all the eight environments (four locations at two seasons) was made. For seed quality characters, a combined analysis of variance was made over Gemmiza, Giza and Sids in 1997-1998 season only.

The analysis of variance in 1996-1997 and 1997-1998 (not tabulated) showed highly significant differences between all sources of variance (location, genotype and genotype x location interaction) for all studied characters. However, the variance due to environmental effects (locations) was greater than the variance of either genotype or genotype x environment interaction for all characters, except 100-seed weight in the first season and hydration coefficient before cooking (H.C.B). The large effect of lo- cations in the present study is due to the wide variation among tested locations, as they varied widely in environmental conditions such as temperature, soil type and fertil- ity, rainfall and other factors.

Similarly, the combined analysis over years showed that all sources of variance for the main effects (genotypes (G), years (Y) and locations (L) and first order interaction (Y-L, Y-G and G-L) and the second order interaction (Y-L-G) were significant. The highly significant values of variance for genotypes and genotype x environment interaction reflect the differences in performance of genotypes and their interaction, with environment.

Seed yield character

Seed yield (kg/fed) data given in Table (2) reveal significant differences among genotypes. The seed yield of the check variety Giza 9 was 501.3kg/fed (3.1 ardab/fed). The highest seed yield obtained was for the genotype 162 (614 kg/fed) and this value was significantly different from Giza 9. Seed yield of all genotypes ranged from 325 to 614 kg/fed, with an overall mean of 474 kg/fed (2.96 ardab/fed).

As shown in Table 3, moderate variability exists among genotypes in seed yield (kg/fed). The variance component due to genotype x year effect was absent (σ^2 gy/y = 0), whereas the variance component due to genotype x environment and genotype x environment x year effects were 22 and 34% of the overall phenotypic variance, respectively. These results reveal the prevalence of environmental effects on the expression of seed yield. This is confirmed by the low coefficient of genetic variance, which was 0.85. Hence, this character has low broad sense heritability of 0.41 and low expected genetic advance of 13.4%.

These results agree with the findings of Rao and Yadav (1988) who reported low coefficient of genetic variance and low broad sense heritability value of 23.1% for seed yield.

It is worth mentioning that there were highly significant differences among genotypes averaged over environments for seed yield. There was also highly significant genotype x environment interaction, which revealed that the performance of the genotypes in this study varied under environments (locations). Thus these experiments make it clear that there are opportunities for improving lentil yield by selection among genotypes and that selection would be more effective under certain locations.

Yield component characters

Number of pods and seeds/plant showed wider ranges of 20.1-32.6 and 24.3-41, respectively, compared with the range of 2.1-4.2 for 100 -seed weight (Table 3). The highest number of pods/plant was for the genotype FLIP 91-12L, which differed significantly from Giza 9 (Table 2). The variance components due to the three interaction effects for pods/plant and seeds/plant presented in Table 3 showed no effects of environment and genotype x year interaction as their portions of overall phenotypic variance were zero. While the variance components due to genotype x environment x year interaction were represented by (82%) for pods/plant and (62%) for seed/plant overall phenotypic variance. In contrast, the variance components due to the three interaction effects for 100-seed weight were very low only and recorded 80% for σ^2ge, 0% for σ^2gy and 8% for σ^2gey of overall phenotypic variance. These results indicate that 100-seed weight was less influenced by environment and year effects than the other two characters. Therefore, 100-seed weight showed higher value of coefficient of genetic variation of (17.8) than pods/plant (8.33) and seeds plant (10.05). These results have affected the heritability and genetic advance of these characters.

The 100-seed weight which was less affected by either environment or year factors, had the highest broad sense heritability (0.85) and genetic advance (30.1%) among the yield component characters. The corresponding values for pods/plant were 0.36 and 10.3%, while they were 0.51 and 14.7% for seeds/plant (Table 3). The existence of high genetic variability, heritability and expected genetic advance for 100-seed weight suggests that this character could be exploited as selectia criterion in lentil breeding programs.

Several researchers have found high broad sense heritability for 100- seed weight (Erskine *et al.* 1985, and Rao and Yadav, 1988) which is in harmony with our results. Esmail *et al.* (1994) found that environmental variation was notably high for pods/plant and 100-seed weight, which resulted in relatively moderate to low heritability and genetic gain estimates.

However, several workers reported high heritability and genetic advance for number of pods and seeds/plant (Hamdi, 1987). As it is noticed, heritability values reported in those previous studies are considerably higher than those obtained in our study.

This may due to the nature of the genetic materials used, the environmental conditions and the relatively large number of environments used (8 environments) in the present study.

Seed quality characters:

The data in Table 4 showed that H.C.B. and H.C.A. characters had the widest ranges of 101-136 and 44-65, respectively, followed by seed cookability character with a range of 53.3-72, followed by seed protein content with a range of 18-25. The range of seed protein content found in the present study was close to the ranges reported by several authors. Hamdi and Elemery (1996) reported a range of 22-28%, Hamdi *et al.* (1991), reported a range of 24-26% and Erskine *et al.* (1985) found a range of 26-29%.

Overall means of H.C.B. for all genotypes ranged from 100.5 for FLIP 89-51L to 135.8 for FLIP 91-12L, while Giza 9 gave a value of 126.2. The wide range of H.C.B. indicate that the tested genotypes differ in potential to imbibe water. A high capacity to absorp water indicates good seed quality. Several factors have been identified to influence seed water uptake. These include the age and composition of dry seeds, storage conditions, moisture contents and production factors. The percentage amount of water uptake by cooked seeds was represented by hydration coefficient after cooking (H.C.A.). The overall means of H.C.A for all genotypes showed significant differences among genotypes. The range of this character was from 43.7% for FLIP 89-60L to 64% for ILL 4403 (Table 4). Giza 9 had value of 58% H.C.A. Although the range of the H.C.A. values is narrow, the differences between genotypes allow selection among them. In fact the soaking process in which seed imbibe water, is greatly dependent on the inherent physio-chemical composition of the seed. Sathe and Salunkhe (1981) reported that the polar amino groups of protein molecules are the primary water binding sites.

The results of seed cookability present in Table 4 show significant differences among lentil genotypes. The local check variety Giza 9 had 60% cookability value. The values of this character for all genotypes ranged from 53.3% for FLIP 94-1L to 71.7% for FLIP 95-49L.

Among quality characters, H.C.A. was the character most influenced by environment as its genotype x environment interaction variance component represented 77% of phenotypic variance (Table 5). The other seed quality characters exhibited various genotype x environment variance components of phenotypic variance. These estimates were 44% for seed protein content, 28% for H.C.B. and 36% for seed cookability. Hence, they are also influenced by environmental effect to some extent. The values of genotype x environment interaction variance affected the magnitudes of genotypic variance estimates of these characters. For example, H.C.A. character, which was the most influenced by environmetal effects had the lowest value of coefficient of genetic variation of 0.46, and the lowest broad sense heritability of 0.002 among all quality characters. These low estimates make the expected genetic advance estimate for this character very low (0.05%). A Similar trend of low heritability and genetic advance was observed for seed cookability character as presented in Table 5. However, seed protein content and H.C.B. characters showed relatively high coefficient of genetic variation, heritability and genetic advance. Seed protein content was found to be influenced significantly by location effects (Erskine *et al.* 1985; Hamdi, 1987), which is in agreement with our results.

It could be concluded that results of studied characters show that the estimates of broad sense heritability was high for 100-seed weight. (h^2 b.s.= 0.85) followed by number of seeds/plant (0.51), seed protein content (0.56) and H.C.B. (0.68). But the remaining characters; number of pods/plant, seed yield, H.C.A. and seed cookability had low heritability values (0.002-0.41). The magnitudes and trends of heritability and genetic estimate are comparable, in most cases, to those previously reported in lentil.

Heritability is useful for comparing traits with respect to their usefulness as aids to selection. The genetic advance from selection depends on the heritability estimates, the magnitude of phenotypic variance and the proportion selected and the validity of selection is dependent upon the expected genetic advance. Johnson *et al.* (1955) stated that heritability estimates together with genetic gains are more useful than the heritability values alone in predicting the resultant effect of selection. The 100-seed weight trait was found to be the most heritable and stable character. It was relatively uninfluenced by environment or season and had the highest coefficient of genetic variation, broad sense heritability and genetic advance amongst all characters studied. On the basis of the relatively high heritability, coefficient of genetic variation and genetic advance, pronounced progress should be expected from selection for 100-seed weight. Moderate progress from selection between genotypes should be expected with number of seeds/plant. However, lower genetic advance should be expected from selection among genotypes for seed yield, H.C.B., number of pods/plant and seed protein content.

Table 1. Description of lentil genotypes.

No.	Genotypes	Origin	Pedigree	Comments
1	FLIP 86-51L	ICARDA	ILL 4349 x ILL 4605	Selction from hybrid line
2	FLIP 78-70L	ICARDA	ILL 2526 x ILL 253	Selction from hybrid line
3	FLIP 87-72L	ICARDA	ILL 2526 x ILL 4354	Selction from hybrid line
4	FLIP 88-34L	ICARDA	ILL 5584 x ILL 2501	Selction from hybrid line
5	FLIP 89-51L	ICARDA	ILL 4605 x ILL 15	Selction from hybrid line
6	FLIP 89-60L	ICARDA	ILL 4225 x ILL 353	Selction from hybrid line
7	FLIP 90-14L	ICARDA	ILL 2168 x ILL 5426	Selction from hybrid line
8	FLIP 91-12L	ICARDA	ILL 5744 x ILL 4605	Selction from hybrid line
9	FLIP 92-42L	ICARDA	ILL 5507 x ILL 5698	Selction from hybrid line
10	FLIP 92-47La	ICARDA	ILL 4354 x ILL 6003	Selction from hybrid line
11	FLIP 92-47Lb	ICARDA	ILL 4354 x ILL 6003	Selction from hybrid line
12	FLIP 94-1L	ICARDA	ILL 7616	Selction from hybrid line
13	FLIP 95-49L	ICARDA	ILL 7705	Selction from hybrid line
14	X 90-S-237	ICARDA	ILL 5582 x ILL 6428	Selction from hybrid line
15	X 91-S-173	ICARDA	ILL 5761 x ILL 5873	Selction from hybrid line
16	X 91-S-186	ICARDA	ILL 939 x ILL 6246	Selction from hybrid line
17	X G 88-18	Egypt	ILL 5883 x ILL 5572	Selction from Egyptain line
18	ILL 4403	Pakistan	Landrace	Selction from ICARDA line
19	16	Pakistan	Landrace	Promising line in Egypt
20	IL 1	India	Landrace	Promising line in Egypt
21	Giza 9	Egypt	Landrace	Wide spread Egyptian variety
22	Giza 370	Egypt	Landrace	Wide spread Egyptian variety
23	Sinai 1	Egypt	-----------	Selection from Argentinian variety "Precoz", a new released variety in Egypt, early in maturity and large seeded.
24	Fam. 29	Egypt	Landrace	Egyptian landrace

Table 2. The overall means of yield and yield component characters for 24 lentil genotypes evaluated in 4 environments in two seasons (1997-98 and 1998-99).

No.	Genotypes	Seed yield (kg/fed)	No.of pods/plant	No.of seeds/plant	100-seed weight (g)
1	FLIP 86-51L	324.8	20.10	24.27	4.20
2	FLIP 78-70L	520.3	28.38	38.06	2.38
3	FLIP 87-72L	419.8	26.91	30.90	3.00
4	FLIP 88-34L	572.8	32.14	37.15	2.57
5	FLIP 89-51L	454.0	26.62	33.28	3.53
6	FLIP 89-60L	470.0	22.36	28.62	2.07
7	FLIP 90-14L	392.3	23.19	28.70	3.15
8	FLIP 91-12L	347.0	32.62	34.98	2.81
9	FLIP 92-42L	385.0	24.27	31.77	2.73
10	FLIP 92-47La	540.0	20.71	38.07	2.41
11	FLIP 92-47Lb	443.5	23.15	31.68	2.40
12	FLIP 94-1L	507.0	26.61	38.14	2.20
13	FLIP 95-49L	394.0	22.51	27.18	2.74
14	X 90-S-237	448.3	22.71	24.93	2.27
15	X 91-S-173	408.3	27.02	28.23	2.64
16	X 91-S-186	469.5	29.52	29.32	2.27
17	X G 88-18	546.3	23.43	34.66	2.56
18	ILL 4403	475.0	32.06	37.58	2.07
19	162	613.8	27.96	40.74	2.25
20	IL 1	493.0	22.01	35.53	2.27
21	Giza 9	501.3	27.80	35.48	2.51
22	Giza 370	536.0	26.05	30.93	2.55
23	Sinai 1	529.3	23.39	27.13	3.63
24	Fam. 29	575.5	25.32	32.16	2.53
Average		474	25.70	32.48	2.68
L.S.D. 5%		26.6	1.23	2.10	0.04

Table 3. Range and estimates of phenotypic (σ^2ph), genotypic (σ^2g) variance components; ratio of genotype x environment (σ^2ge), genotype x year (σ^2gy), genotype x environment x year (σ^2gey) to phenotypic variance; coefficient of genetic variance (C.G.V.), heritability in brood sense ($h^2_{b.s.}$) and expected genetic advance from selection (GA%) for yield and yield component characters.

Genetic parameters	Seed yield (kg/fed)	No.of Pods/plant	No.of Seeds/plant	100-seed weight (g)
Range	324.4-613.5	20.1-32.6	24.3-41	2.1-4.2
σ^2 ph	5609.78	12.68	21.08	0.27
σ^2 g	2273.12	4.58	10.66	0.23
(σ^2ge/e)/ σ^2ph	0.22	0.00	0.00	0.08
(σ^2gy/y)/ σ^2ph	0.00	0.00	0.00	0.00
(σ^2gey/ey)/ σ^2ph	0.34	0.82	0.62	0.08
C.G.V.	0.85	8.33	10.05	17.8
$h^2_{b.s.}$	0.41	0.36	0.51	0.85
GA (%)	13.4	10.3	14.7	30.1

Table 4. The overall means of seed quality characters of lentil genotypes tested in three locations in 1998-99.

No.	Genotypes	Seed protein content %	H.C.B.	H.C.A.	Coc. %
1	FLIP 86-51L	21.5	122.5	59	63.3
2	FLIP 78-70L	17.6	114.8	56.3	60
3	FLIP 87-72L	21.9	118.3	47.7	60
4	FLIP 88-34L	20.5	130.5	44.2	58.3
5	FLIP 89-51L	21.6	100.5	46.3	63.3
6	FLIP 89-60L	20.9	129.3	43.7	61.7
7	FLIP 90-14L	21.7	108.7	57.2	58.3
8	FLIP 91-12L	23.2	135.8	45.3	65
9	FLIP 92-42L	20.3	127.8	50.5	55
10	FLIP 92-47La	18	123.7	52.3	56.7
11	FLIP 92-47Lb	18.5	125.5	48	61.7
12	FLIP 94-1L	18.4	127	53.7	53.3
13	FLIP 95-49L	20.2	116.8	59.2	71.7
14	X 90-S-237	18	131.7	57.7	65
15	X 91-S-173	24.8	121.3	45.3	61.7
16	X 91-S-186	20.4	130.8	53.7	53.3
17	X G 88-18	20.3	129.7	53.5	55
18	ILL 4403	20.8	132.5	64.5	58.3
19	162	19.3	129.5	44.8	63.3
20	IL 1	21.3	129.7	53.7	56.7
21	Giza 9	21	126.2	58	60
22	Giza 370	20.2	129.7	54.8	56.7
23	Sinai 1	19.2	105.8	60.2	58.3
24	Fam. 29	22.3	135.2	57.8	66.7
Average		20.5	124.3	52.8	60.1
L.S.D. 5%		0.15	3.87	5.2	6.61

Table 5. Range and estimates of phenotypic (σ^2 ph), genotypic (σ^2 g) variance components, ratio of genotype x environment (σ^2 ge) to phenotypic variance coefficient of genetic variance (C.G.V.), heritability in broad sense ($h^2_{b.s.}$) and expected genetic advance from selection (GA%) for seed quality characters.

Genetic parameter	Seed protein Content (%)	Hydration coefficient (H.C.B.)	Hydration coefficient (H.C.A.)	Seed cookability (%)
Range	18-25	101-136	44-65	53.3-72
σ^2 ph	3.02	85.33	35.4	19.79
σ^2 g	1.68	57.93	0.06	2.88
(σ^2ge/e)/ σ^2ph	0.44	0.28	0.77	0.36
C.G.V.	6.33	6.12	0.46	2.82
$h^2_{b.s.}$	0.56	0.68	0.002	0.15
GA (%)	9.7	10.4	0.05	2.2

REFERENCES

1. Abu-Shakra, S. and R.I. Tannous (1981). Nutritional value and quality of lentils. *In*: Lentils, Webb, C. and Hawtin, G. (eds.). Commonwelth Agricultural Bureaux, pp. 191-202.

2. Allard, R.W. (1960). Principle of plant breeding. John Wiley & Sons, New York, USA pp. 485.

3. A.O.A.C. (1990). Official methods of analysis of the association of official analytical chemists. Fifteenth edition, A.O.A.C., Washington DC, USA.

4. El-Hashimy, F.S.A.; E.T. El-Ashwah, N.N.Abdel-Aal and A.A. Hassan, (1985). Effect of Soaking and cooking on the biological value of some Egyptian legumes. Egypt. Food Sci. 13:113.

5. Erskine, W. and J.R. Witcombe (1984). Lentil germlasm catalog. International Center for Agricultural Research in The Dry Areas (ICARDA), P.O. Box 5466, Aleppo, Syria.

6. Erskine, W; P.C. Williams and H. Nakkoul (1985). Genetic and environmental variation in the seed size, protein, yield and cooking quality of lentil. Field Crops Res. 12: 153-161.

7. Esmail, A.M.; A.A. Mohamed, A, Hamdi, and E.M. Rabie (1994). Genetic variability and heritability for agronmic traits in segregating populations of lentil (*Lens culinaris* Medik.). Annals of Agric Sci., Moshtohor. 32:1107-1118.

8. Fahmy, H.M.; S. Srivastava and M.A. Uebersax (1996). Physical and textural characteristics of soaked and cooked American Common Beans. Egypt. J. Food Sci. 24 (2): 1.

9. Gomez, K.A. and A.A. Gomez (1984). Statistical procedures for Agricultural research. 2nd edition, John Wiley & Sons. New York, USA.

10. Hamdi, A. (1987). Variation in lentil (*Lens culinaris* Medik.) in response to irrigation. Ph. D. Thesis, Faculty of Science. Durham University. Durham, U.K.

11. Hamdi, A. and M.I. Elemery (1996). Evaluation of some seed quality characters in the promising lentil genotypes in Egypt. Annals of Agric. Sci. Ain Shams Univ. Cairo., 41 (2): 725-738.

12. Hamdi, A.; W. Erskine and P.Gates (1991). Relationships among economic characters in lentil. Euphytica, 57: 109-116.

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

14. Rao, S.K. and S.P. Yadav (1988). Genetic analysis of biological yield, harvest index and seed yield in lentil. Lens Newsletter, 15 (1): 3-5.

15. Sathe, S.K. and D.K. Salunkhe (1981). Functional properties of the great northern beans (*Phaseolus vulgaris* L.). Protein emulsion, foaming, viscosity and gelatin properties. J. Food Sci. 46: 71.

التباين الوراثي والبيئي لمحصول البذور ومكوناته ونسبة البروتين وجودة الطهي في العدس

أحمد حمدي[1] وسميه محمد مرسي[2] و الغريب محمد الغريب[3]

١ معهد بحوث *المحاصيل الحقلية*، مركز *البحوث الزراعية، الجيزة*.
٢ معهد بحوث تكنولوجيا *الأغذية*-مركز *البحوث الزراعية، الجيزة*.
٣ قسم *المحاصيل، كلية الزراعة*، جامعة *الأزهر، القاهرة*.

أجريت هذه الدراسة بهدف معرفة التأثيرات الوراثية والبيئية على الإنتاجية وصفات الجودة لبذور محصول العدس، وقد تم اقامة ٨ تجارب حقلية بأربع محطات بحثية في موسمي ١٩٩٧-٩٨و ١٩٩٨-٩٩، وذلك باستعمال ٢٤ تركيبة وراثية مختلفة من العدس، وقد تم دراسة الصفات الاتية: محصول بذور الفدان (كجم)، عدد القرون/نبات، عدد البذور/نبات، وزن الـ ١٠٠ بذرة، نسبة البروتين بالبذور، معامل الامتصاص للبذور قبل وبعد الطهي والنسبة المئوية لطهي البذور.

وقد أظهرت النتائج أنه بالاخذ في الاعتبار نسبة التوريث العالية، ومعامل التباين الوراثي ومدي التقدم الوراثي المتوقع بالانتخاب فاننا نتوقع تحقيق تقدم ملحوظ اذا تم الانتخاب لصفة وزن الـ ١٠٠ بذرة، بينما نحصل على تقدم متوسط اذا تم الانتخاب لصفة عدد البذور للنبات، ولكن نتوقع تقدما ضعيفا اذا تم الانتخاب لصفات محصول البذور، معامل الامتصاص قبل الطهي، عدد القرون للنبات ونسبة البروتين بالبذور.