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EVALUATION OF SOME SOYBEAN GENOTYPES FOR MORPHOLOGICAL,YIELD AND YIELD COMPONENTS AND YIELD ANALYSIS

Hamada, A.A.*; M.A. Elborai; Ola A.M.El-Galaly**; R. M. Khalaf*; A.R. Morsy**; I.H. Darwish*** and M.A. Khalifa***

*** Field Crops Dept., National Gene Bank and Genetic Resources, Giza**

**** Food Legume Research Dept., Field Crops Research Institute, ARC**

***** Agron. Dept., Fac. Agric . Minufiya University.**

ABSTRACT

A field experiments was carried out at El-Gemmiza research station during 2005 and 2006 summer seasons. The objective of this investigation was aimed to evaluate and characterize 54 exotic and Egyptian soybean genotypes. Also ,their reaction to cotton leaf worm was studied. Correlation and factor analysis procedures were used to determine the contributing characters to yield variation. The main findings could be summarized as follows :

Results showed that the seven genotypes Patty, Dekabig ,Sapporo, Osaka, Major, Hardin and L86-k-73 were the earliest flowering and maturity dates.

The six genotypes: Giza 35 , H_1L_{10} ,H_1L_{32}, H26z, and H_1L_{12} were resistant cotton leaf worm while the genotypes of Giza 21 ,Giza 83, Giza 111, Toano , H3z, H_2L_{12} ,H_2 L_{24}, L86-K-73 , Major and H_2 L_{20} were the lowest defoliation percentage for cotton leaf worm.

The results indicated that genotypes of Giza 111 , Giza 21 , Giza 22 , Holladay, Crawford and H_1L_{32} had the highest number of seed/plant ,100- seed weight ,seed weight /plant and seed yield /fed.. The genotypes Giza 111 and Toano had the highest mean values for seed yield /plant ,100 seed weight ,number of pods /plant and number of seed /plant and gave the lowest defoliation percentage for cotton leaf worm .The genotype H_1 L_{10} gave the highest seed yield and number of pods /plant , number of seeds /plant and was resistance for cotton leaf worm .Also the genotypes H_1 L_{32} and Giza 35 had desirable values for seed yield and 100 seed weight in addition to resistance for cotton leaf worm .

The results showed a significant and positive associations were detected between seed weight /fed. and each of flowering ,and maturity dates, number of pods/plant, plant height, 100-seed weight ,number of seeds/plant, seed yield/plant, and stem termination. However, seed yield /fed was highly significant negatively correlated with the percentage % resistance to cotton leaf worm.

Factor analysis grouped fourteen yield contributing characters into four main factors accounting for 71.771 % of the total variability in the dependence structure .Factor 1 was responsible for 31.715 of the total variation and contained number of branches /plant ,number of pods /plant , number of seeds/plant and seed weight /plant .Factor II included plant height , 100 seed weight , stem termination and resistance percentage to cotton leaf worm and responsible for 16.265%o of the total variation. Factor III contained flowering and maturity dates .and contributed 14.177% of the total variation in the structure . Factor IV was responsible for 9.614 % of the total variation and contained flower color and pubescence color.

It could be concluded that soybean genotypes of Giza 21, Giza22, Giza111, Crawford, Hollady and H_1L_{32} were the highest productivity and more resistance to cotton leaf worm. Yield component of number of branches ,pods ,seeds and seed yield per plant were more contribution to seed yield and contributed by 31.71% of total seed yield and plant growers must be put these characters in his consideration in breeding programe.

INTRODUCTION

Soybean {*Glycine max* (L.) Merr.} is the major oil crop in the world, which share with about 30% of the total world production of edible oil. Also, soybean share with more than 60% of the world production of high protein meal. Soybean planting was started in Egypt with the introduced cultivars from U.S.A in 1960 and has been produced commercially since 1972. During the 1970's the cultivars Harisoy, Calland and Williams were grown. In the 1980's Clark and Crawford replaced the previous cultivars then soybean area has increased gradually to reach more than 147,000 feddans in 1983 .The average seed yield has increased during the same period from 477 to 1099 kg/fed. Since 1984 the soybean area started to decrease annually to reach about 30,000 feddan in 2003, with an average seed yield 1110 kg/fed. In 1995, the early maturing cultivars Giza 82 and the insect resistant and Giza 21 were released .In 1997 the early maturing and insect resistant Giza 35 was released.

Morphological, yield and yield component identification more important for keeping cultivars in breeding programe and higher production. Determining the important characters that influence the yield is of great importance in breeding programs.Kandil *et al* (2007) concluded that morphological identification of soybean are very important in breeding program of new varieties production for keeping varieties for higher production . Multiple regression in both full model and step wise as well as standard partial regression known as path coefficient are statistical procedures successfully applied to identify the relative contribution of some independent variables on a dependent variable. Walton(1972) explained that the information obtained using these procedures may be misleading .He mentioned that biologists must search for right assistance from statistical methodology . He recommended factor analysis as a type of multivariate technique .Factor analysis reduces a large number of correlated variables to a small number of clusters or patterns of variables called factors .This approach has been used in soybean by El-Rassas and El-Rayes (1992) , Sharief and El-Bially (1992) and in faba bean by Ashmawy *et al* (1998).

The objectives of this study were aimed to identify and evaluate of characterize some exotic and local soybean genotypes .To study factor analysis procedure to assist the dependent relationships between yield and yield components in soybean, which would be helpful to plan appropriate selection methods.

MATERIALS AND METHODS

A total of 54 exotic and Egyptian soybean genotypes were used in this study (table 1). The exotic materials were received from U.S.A and Czech. The wide spread Egyptian varieties i.e. Giza 21, Giza 22, Giza35, Giza82, Giza 83 and Giza 111 were used as checks. These genotypes were grown at El-Gemmeiza Agricultural Research station ,Egypt during May 2005 and 2006 summer seasons in a randomized complete block design with three replications .Each plot consisted of 4 ridges 3.5 m long and 70 cm apart , Cultural practices were maintained at optimum levels for maximum soybean productivity .At ,maturity .soybean plants in the central two ridges in each experimental plot were harvested handly,while the remaining plot area was discarded to avoid border effect .

Studied characters:

A-Earliness and vegetative characters:

Days from planting to 50% flowering and 95% maturity were recorded on plot basis. Also, stem termination, flower color , pubescence color, pubescence type, and the %resistance to leaf feeding insects determined on plot basis.

B- Yield components:

At harvest, a random sample of 10 guarded plants was collected from the central ridges in each plot to record characters of flowering date, maturity date, plant height, number of branches/plant, number of pods/plant, number of seeds/plant, 100-seed weight and seed yield/plant.

Statistical procedures:

A combined analysis of variance of randomized complete block design over 2005 and 2006 summer seasons was performed according to Snedecor and Cochran(1980).

C- Yield analysis:

1-**Correlation analysis**:

Simple correlation coefficients were computed among seed yield/plant and its component according to Snedecor and Cochran(1980).

2- **Factor analysis**:

The factor analysis procedure basically reduces a large number of correlated variables to a small number of uncorrelated, Cattle(1965). When the contribution of a factor to the total percentage of the trace is less than 10%,the process stops. After extraction, the matrix of factors is transmitted to a varimax orthogonal rotation, as applied by Kaiser(1958). The effect of rotation is to accentuate the large loading in each factor and to prevent the minor loading coefficient for improving the opportunity to achieve a meaningful biological interpretation of each factor. A communality (h^2)is the variance amount of a variable accounted for the common factors together. Since the purpose was to determine the way in which yield components are related to each other, yield was not included in this structure. Factor analysis was performed using SPSS computer statistical package.

Correlation and factor analysis techniques were applied to the means of both seasons for characters of number of days to 50% flowering and maturity, number of branches/plant, number of pods/plant, plant height, 100-seed weight ,number of seeds/plant, seed yield/plant, stem termination, flower color , pubescence color, pubescence type, and the %resistance to cotton leaf worm.

Table 1: Maturity group and origin of studied soybean genotypes .

No.	Genotype	Maturity groups	Origin
1	Crawford	IV	U.S.A.
2	Giza 21	IV	Egypt
3	Giza 22	IV	Egypt
4	Giza35	III	Egypt
5	Giza82	III	Egypt
6	Giza 83	III	Egypt
7	Giza 111	IV	Egypt
8	Clark	IV	U.S.A.
9	Columbus	VI	U.S.A.
10	Ware	IV	U.S.A.
11	Linford	III	U.S.A.
12	McCall	00	U.S.A.
13	Holladay	V	U.S.A.
14	Toano	V	U.S.A.
15	H_1L_{10}	IV	Egypt
16	H_1L_{32}	IV	Egypt
17	H3Z	IV	Egypt
18	H26Z	IV	Egypt
19	H_2L_{12}	IV	Egypt
20	$H_{15}L_5$	IV	Egypt
21	H_1L_{12}	IV	Egypt
22	H_2L_{24}	IV	Egypt
23	H_2L_{16}	IV	Egypt
24	L86-K-73	II	U.S.A.
25	DR 101	VI	U.S.A.
26	ALISA	O	Czechoslovakia
27	PROTEINKA	O	Czechoslovakia
28	LANA	II	Czechoslovakia
29	NOVOSADANKA	I	Czechoslovakia
30	TEA	I	Czechoslovakia
31	VOJVODANKA	II	Czechoslovakia
32	VENERA	II	Czechoslovakia
33	LIDISA	II	Czechoslovakia
34	NENA	II	Czechoslovakia
35	Cutller 71	IV	U.S.A.
36	L62-1686	IV	U.S.A.
37	L75-6648	IV	U.S.A.
38	Calland	III	U.S.A.
39	Elgin	IV	U.S.A.
40	Hardin	I	U.S.A.
41	H_3L_2	IV	Egypt
42	Major	I	U.S.A.
43	Weber	I	U.S.A.
44	H47	IV	Egypt
45	D84-8940	V	U.S.A.
46	Forrest	V	U.S.A.
47	H_2 L_{20}	IV	Egypt
48	Patty	III	U.S.A.
49	Dekabig	III	U.S.A.
50	Sapporo	III	U.S.A.
51	Osaka	III	U.S.A.
52	H_{15} L_{17}	IV	Egypt
53	H 54	III	Egypt
54	Hutcheson	V	U.S.A.

RESULTS AND DISCUSSION

A-Earliness and vegetative characters:

Origin and maturity groups of fifty four soybean genotypes and their agronomic characters are presented in Tables 1 and 2.Combined analysis of variance over the two seasons revealed significant difference between genotypes for all studied characters indicating wide genetic variation among genotypes. Flowering and maturity dates mean values were presented in Table (2).Results revealed that the nine genotypes Patty, Dekabig ,Sapporo ,Osaka ,Major, Hardin ,McCall,Venera ,$H_{15}L_{17}$ and L-86-K-73 were the earliest in flowering dates and ranged from 19.7 to 31.0 days for this trait .Similarly ,the same genotypes matured in 82 to 103 days being earlier than the other genotypes .On the other hand , D84-8940, H_2L_{16}, H26z, Ware, Holladay and H47 genotypes were the latest in the flowering dates and ranged from 55.0 to 62.0 dates ,while the genotypes Columbus , D84-8940, H47, H_2L_{16} , and H_3L_2 were the latest in the maturity and ranged from 138.0 to 158.0 days .The rest genotypes were intermediate .In addition the best genotypes for earliness were patty , Dekabig and Major .Similar conclusions were reported by Mohamed and Faiza Morsi (2005).

Results in Table (2) indicated that, the plant growth type was indeterminate for all genetic stocks of soybean except Ware ,Alisa , Proteinka ,Lana, Novosadanka,Tea,Vojvodanka, Venera , Lidisa ,Nena L62-1686, D84-8940,Patty, Sapporo, and Hutcheson which were determinate and the genotypes of McCall, Holladay, Toano ,DR101and Forrest which were semi determinate to indeterminate.

With regard to Flower color, ten genetic stock (Giza 83, Linford , H_1L_{10}, H_1L_{32} ,H_1L_{12} ,L86-k-73 ,Alisa, Lana Lidisa and Hutcheson) had white flowers, while the other genotypes were purple . Concerning pubescence color, genotypes could be classified into two categories .The first category showed gray hairs of main stem in (Giza 83 , Ware , H_1L_{10} , H_1L_{32}, H_1L_{12} , L86-K-73 , Novosadanka, Lidisa , and Hutcheson). The remaining genotypes had tawny hairs of main stem .Regarding pubescence density genotypes it could be classified into four categories .The fourth category includes (Sapporo, Ware , Linford ,Holladay ,Toano, H_1L_{10} , H3z, H26z, H_2L_{12},H_1L_{12},L86K73, DR101, Calland, Elgin ,Hardin, Weber , H47 H_2L_{20}, Dekabig and Osaka) which were strong for this trait. In addition, the rest genotypes were pubescence medium. These results were agreement to those previously reported by Bramel *et al.* (1984) and Abdalla, Safia,*et al* (2004)

Results showed wide variation in defoliation percentage for cotton leaf worm .Six genotypes of Giza 35 , H_1L_{10} ,H_1L_{32}, H26z,H_1L_{12} and Hardin were cotton leaf worm resistant and ten genotypes (Giza 21 ,Giza 83, Giza 111, Toano , H3z, H_2L_{12} , H_2 L_{24}, L86-K-73 , Major and H_2 L_{20}) gave the lowest defoliation percentage for cotton leaf worm. The genotype Hardin gave the earliest flowering and maturity dates and was resistance to cotton leaf worm r.These conclusions were similar to those previously reported by Tcacenco, *et al* (1985) and Lutfallah *et al* (1998).

Table 2: Mean values of morphological characters of soybean genotypes over 2005/2006 seasons

Genotypes		Days to lowering	Days to maturity	Stem Term	Flower Color	Pubescence Co.	Pub. Type	%resistance
Crawford		39.0	126.0	4	2	2	5	60
Giza 21		47.0	132.0	4	2	2	5	5
Giza 22		42.0	126.0	4	2	2	5	10
Giza35		42.0	112.0	4	2	2	5	0
Giza82		44.0	115.0	4	2	2	5	30
Giza 83		39.0	112.0	4	1	1	7	5
Giza 111		41.0	131.0	4	2	2	5	5
Clark		42.0	132.0	4	2	2	5	25
Columbus		42.0	158.0	4	2	2	5	20
Ware		59.0	126.0	1	2	1	7	10
Linford		43.0	120.0	4	1	2	7	20
McCall		31.0	113.0	2	2	2	5	15
Holladay		56.0	140.0	3	2	2	7	20
Toano		57.0	145.0	3	2	2	7	5
H_1L_{10}		46.0	124.0	4	1	1	7	0
H_1L_{32}		49.0	115.0	4	1	1	5	0
H3Z		41.0	120.0	4	2	2	7	5
H26Z		61.0	130.0	4	2	2	7	0
H_2L_{12}		34.5	128.6	4	2	2	7	5
$H_{15}L_5$		43.0	127.0	4	2	2	5	20
H_1L_{12}		50.0	133.0	4	1	1	7	0
H_2L_{24}		50.0	129.0	4	2	2	5	5
H_2L_{16}		61.0	137.0	4	2	2	5	10
L86- K-73		29.3	108.3	4	1	1	7	5
DR 101		40.0	149.7	3	2	2	7	25
ALISA		30.0	82.0	1	1	2	5	40
PROTEINKA		31.0	84.0	1	2	2	5	40
LANA		33.0	114.0	1	1	2	5	30
NOVOSADANKA		33.0	104.0	1	2	1	5	25
TEA		33.0	103.0	1	2	2	5	20
VOJVODANKA		32.0	113.0	1	2	2	5	15
VENERA		28.0	113.0	1	2	2	5	30
LIDISA		30.0	113.0	1	1	1	5	50
NENA		39.0	108.0	1	2	2	5	30
Cutller 71		35.0	127.0	4	2	2	5	50
L62-1686		35.0	152.0	1	2	2	5	15
L75-6648		33.0	158.0	4	2	2	5	25
Calland		34.0	126.0	4	2	2	7	20
Elgin		48.0	127.0	4	2	2	7	15
Hardin		28.0	95.0	4	2	1	7	0
H_3L_2		35.0	136.0	4	2	2	5	15
Major		27.0	97.0	4	2	2	5	5
Weber		31.0	113.0	4	2	2	7	15
H47		55.0	148.0	4	2	2	7	15
D84-8940		62.0	152.0	1	2	1	5	20
Forrest		41.0	144.5	3	2	2	5	10
$H_2 L_{20}$		37.7	126.0	4	2	2	7	5
Patty		19.7	82.0	1	2	2	5	40
Dekabig		20.3	86.0	4	2	2	7	35
Sapporo		21.0	90.7	1	2	2	5	45
Osaka		21.0	89.0	4	2	2	7	30
$H_{15} L_{17}$		29.3	126.5	4	2	2	5	20
H 54		33.3	116.2	4	2	2	5	10
Hutcheson		43.2	152.5	1	1	1	5	20
Average		39.0± 1.45	118.6± 2.16	3.055± 0.18	1.814± 0.05	1.796± 0.05	5.74± 0.132	18.42± 1.98
Range	Minimum	19.7	82.0	1.0	1.0	1.0	5.0	00
	Maximum	62.0	158.0	4.0	2.0	2.0	7.0	60.0

B.Yield and yield components.

The combined results of yield and its components over seasons are shown in Table (3). The results revealed significant differences among studied genotypes for all studied characters. Genotypes of H_2L_{16} ,H26z ,H_3L_2 ,Giza 21,Giza 82,H3z, Crawford, $H_{15}L_5$,Giza 111 and H_2L_{12} were significantly taller than the other genotypes .On the other hand , plants of Lana ,Alisa, Novosadani , Vojvodanka , Proteinka , Dr101, Patty , Dekabig ,and Tea were the shortest genotypes .

Results showed wide variation in number of branches /plant .Nine genotypes Elgin, Columbus, Calland, Cutller 71 , H3L2 , Ware , L75-6648 , L62-1686 and Linford were produced the largest number of branches /plant which ranged from 5.2 to 9.9 branches / plant. On the other hand ,plants of H3z ,Lidisa ,Tea, Crawford, Giza 21 Giza 22 and Giza 111 genotypes were gave the lowest number of branches /plant. Results indicated also that there was a wide variation in number of pods /plant . Sixteen genotypes of $H_{15}L_{17}$, Weber, Toano, DR101, L62-1686, H47, D84-8940 ,H_1L_{10} , Forrest , H_2L_{20} , H54 , Hutcheson , Calland , L75-6648 ,Giza 111 and Elgin were produce the largest number of pods /plant and ranged from 100 to 113.58 pods/plant for this trait .Weight of 100 seeds which ranged between 9.5 to 18.29 g with an overall average 100 seed of 13.94g,indicating that most of tested genotypes are medium and large seeded but ,the genotype Giza 21, Giza 22,Giza 35 ,Giza 111 and Ware gave the heavy weight of 100-seed . Therefore ,large seed index from genotypes should be introduced to Egypt and more attention should be given for selection of large seed types .Also ,results in Table 3 indicated that Giza 35 had the heaviest weight of 100 seed being 18.29 g and ranked the first followed by Ware (18.08 g), Giza 22 (17.90 g) , Giza 111(17.65 g) , Giza 21(17.60 g) ,$H_{15}L_5$ (16.55 g) ,Holladay (16.40 g) ,H3z (16.37 g), Crawford (16.35 g) ,Nena (16.29 g) ,Toano (16.15 g) and Giza 82 (16.10 g) .Consequently ,these medium seeded genotypes would be used in the soybean improvement programs. Results showed wide variation in number of seeds/plant. Seven genotypes Giza 111, Holladay, H_1L_{10}, Toano, H_1L_{32}, Giza 21 and Crawford produced the largest number of seed /plant and ranged from 40.58 to 221.45 seed/plant. On the other hand ,plants of Novosadanka ,Proteinka, Lana, Venera and Lidisa genotypes gave the lowest number of seeds /plant. Results indicated in Table 3 clearly showed that the heaviest seed weight /plant being 44.381 g was produced by Giza 111 followed by Toano ,$H_{15}L_{17}$, H_1L_{10},Crawford , Ware,H_1L_{32},H_2L_{20} and Calland .On the other hand , Major, Tea, Venera , Lana ,Proteinka, Novosadanka genotypes were produced the least seed weight /plant .Seed yield /fed. averaged 1067.72 kg /feddan and had a range of 221 kg to 1698.53 kg /fed. Results in Table 3 show a wide variation in seed yield among the tested genotypes ,Giza 111 ,produced the highest seed yield /fed recording 1698.52 kg /fed. followed by Giza 21 (1613.10 kg./fed.),Giza 22 (1596.8 kg./fed.) , Holladay (1562.50kg./fed.), Crawford (1555.2 kg /fed), H_1L_{32} (1542.7 kg /fed.)and H_2L_{12} (1506.7 kg/fed.).The superiority of these seven genotypes in seed yield could be attributed to their higher in yield component such as number of pods and seed/plant and seed weight /plant compared to other genotypes. These results are in good agreement with those reported by El-Rassas and El-Rayes (1992); Sharief and El-Bially (1992) ,Eisa *et al* (1998) and Mohamed and Faiza Morsi (2005).

Table 3: Mean values of yield and yield components characters as affected by soybean genotypes over 2005/2006 seasons

Genotypes	No.of bran/plant	pods No. /plant	Plant height	100-seed	No. of Seed	Seed yield/plant	seed yield/ fe kg
Crawford	0.7	74.3	112.5	16.35	155.8	40.80	1555.20
Giza 21	0.7	72.4	117.5	17.60	161.7	23.18	1613.10
Giza 22	0.7	79.2	111.2	17.90	138.0	35.44	1596.80
Giza35	1.3	59.7	106.7	18.29	119.2	35.54	1133.00
Giza82	3.0	51.5	115.0	16.10	118.7	34.14	1136.80
Giza 83	2.4	65.5	62.1	12.94	113.8	30.90	1099.00
Giza 111	0.8	100.8	112.5	17.65	221.4	44.38	1698.53
Clark	2.6	69.7	75.0	12.17	124.2	30.33	1252.00
Columbus	8.0	73.4	80.0	10.75	113.7	27.81	1219.00
Ware	6.8	64.5	42.2	18.08	91.2	38.19	914.00
Linford	5.2	65.6	68.1	13.14	114.2	31.43	1184.00
McCall	2.9	72.1	47.5	11.77	80.4	21.23	827.00
Holladay	0.9	84.8	53.3	16.40	212.2	38.81	1562.50
Toano	1.6	109.2	61.6	16.15	184.1	44.11	1364.20
H_1L_{10}	1.3	106.7	103.7	15.35	186.8	40.96	1419.80
H_1L_{32}	1.2	89.5	101.2	16.80	183.9	37.62	1542.70
H3Z	0.3	63.8	115.0	16.37	119.6	29.32	1254.10
H26Z	2.1	64.8	135.0	16.35	112.0	31.35	1276.80
H_2L_{12}	3.4	93.6	110.0	14.88	134.0	34.82	1506.70
$H_{15}L_5$	0.8	79.9	113.7	16.55	119.8	35.07	1220.44
H_1L_{12}	2.3	74.4	105.0	15.83	116.1	35.04	1290.00
H_2L_{24}	2.6	65.9	100.0	14.38	124.7	23.69	1272.30
H_2L_{16}	4.3	72.4	138.3	13.19	101	23.87	1038.00
L86 K73	3.0	94.2	45.3	11.33	95.6	26.69	995.00
DR 101	4.0	108.2	39.3	12.40	118.7	33.57	1172.40
ALISA	1.7	41.2	33.0	12.70	63.0	13.08	587.00
PROTEINKA	1.0	41.3	36.3	13.60	43.3	14.05	338.00
LANA	1.0	42.5	28.0	12.25	46.3	13.02	341.00
NOVOSADANKA	0.9	48.2	34.0	13.27	40.5	16	325.00
TEA	0.6	40.4	39.6	12.48	61.2	12.63	552.00
VOJVODANKA	1.5	48.5	35.6	11.51	61.4	13.97	514.00
VENERA	1.6	40.0	40.0	12.96	51.1	12.98	541.00
LIDISA	0.6	51.4	40.6	14.46	58.5	18.58	221.00
NENA	1.9	42.6	60.6	16.29	66.6	17.37	654.00
Cutller 71	7.8	84.2	70.0	13.37	130.5	28.15	1287.00
L62-1686	5.8	108.0	81.1	13.13	92.5	35.45	987.00
L75-6648	6.0	102.0	91.6	14.43	112.5	36.79	1025.00
Calland	8.0	103.0	78.0	14.53	117.5	37.41	1183.00
Elgin	9.8	100.0	62.2	15.03	120	37.57	1179.00
Hardin	3.7	86.0	50.2	11.70	115	25.15	1273.00
H3L2	6.9	81.5	130.0	14.60	127.7	35.86	1251.00
Major	1.5	48.6	50.0	9.50	91.5	11.54	972.00
Weber	2.6	110.0	70.2	11.22	127.2	30.85	1009.00
H47	2.6	108.0	90.2	12.73	118.6	34.37	1259.00
D84-8940	2.5	107.5	79.8	9.88	94.7	26.55	911.00
Forrest	2.5	105.9	53.7	11.30	94.8	29.92	962.00
$H_2 L_{20}$	2.8	105.7	70.0	14.38	90.2	37.99	933.00
Patty	1.0	91.7	39.3	11.84	129.2	27.14	1040.00
Dekabig	1.1	92.3	39.3	12.70	74.9	29.33	932.00
Sapporo	1.0	96.3	45.0	12.94	70.8	31.16	764.00
Osaka	0.9	95.6	41.5	12.91	69	30.85	695.00
$H_{15} L_{17}$	2.3	113.5	91.0	14.60	123.9	41.45	1259.00
H 54	1.4	104.3	84.0	12.35	129.7	32.20	1158.00
Hutcheson	3.3	104.1	50.0	11.90	138.2	30.97	1362.00
Average	2.7±3.09	79.62±3.13	71.99±4.3	13.949±0.30	111.53±5.4	29.46±1.21	1067.72±48.32
Range 0.35	0.3	40.0	28.0	9.50	40.5	221.0	11.54
9.87	9.8	113.5	138.3	18.29	221.4	1698.53	44.38

C. Yield Analysis

1-Correlation analysis

The matrix of simple correlation coefficient among seed weight /fed. and each of number of days to 50% flowering and maturity, number of branches/plant, number of pods/plant, plant height, 100-seed weight ,number of seeds/plant, seed yield/plant, stem termination, flower color , pubescence color, pubescence type, and resistance percentage to leaf feeding insects are present in Table 4. Results showed that the most important relationships are those between seed weight /fed. and each of number of days to 50% flowering (r=0.39**)and number of days to maturity(r=0.278*),number of pods/plant(r= 0.362**), plant height(r=0.571**), 100-seed weight (r=0.487**), number of seeds/plant(r = 0.370**), seed yield/plant(r=0.537**), stem termination (r =0.661**)and resistance percentage to Insects cotton leaf worm(r = -0.380**). Significant positive correlation was found between flowering dates and each of maturity (r=0.750**), plant height (r= 0.460**),100-seed weight (r= 0.376**)and seed yield/plant (r = 0.280**) .However flowering dates was highly significantly negatively correlated with resistance percentage to Insects cotton leaf worm (r = -0.417**).Maturity date was found to be highly significantly positively associated with number of branches/plant(r = 0.295**), plant height(r= 0.416**), 100-seed weight(r =0.283*) and flower color (r=0.351**),however this trait was highly significantly negatively correlated with resistance percentage to insect cotton leaf worm (r = -0.258*). Positive highly significant correlation was detected between number of branches/plant and each of number of pods/plant(r=0.350**), number of seed/plant(r =0.347**), seed yield/plant(r=0.322**), and flower color (r=0.330**). Correlation between number of pods /plant and each of number of seed/plant, seed yield/plant, stem termination and pubescence type was found to be positive highly significant with r values being 0.362**,0.999**, 0.914**, 0.397** and 0.423** ,respectively . However, number of pods /plant was highly significantly negatively correlated with resistance percentage to Insects cotton leaf worm (r = -0.287*). Highly significant and positive correlation was observed between plant height and each of 100-seed weight (r=0.529**), seed yield/plant(r =0.914**)and stem termination(r= 0.578**) while significant and negative with resistance percentage to insect cotton leaf worm (r=-0.352**). Significant and positive correlation was found between 100 seed weight and stem termination(r= 0.299*). Correlation between number of seed/plant, and each of seed yield/plant, stem termination , pubescence type was found to be positive highly significant with r values being 0.916**,0.403**, and 0.421**,respectively. However, number of seed/plant was highly significantly and negatively correlated with resistance percentage to insect cotton leaf worm (r = -0.294*). Seed weight /plant was found to be highly significant and positively associated with stem termination (r=0.519**)and pubescence type (r=0.475**). However this trait was highly significant and negative association with resistance percentage to insect cotton leaf worm (r = -0.392**). Significant positive correlation was observed between Stem termination and pubescence (r=0.373**), while significant and negative with resistance percentage to insect cotton leaf worm (r=-0.426**).

Table 4 : Matrix of simple correlation coefficient among seed weight /fed and its components in soybean over 2005 and 2006 seasons

Characters	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14
	1.00													
Maturity date (x2)	0.750**	1.000												
No. of branches / plant (x3)	0.153	0.295**	1.000											
No. of pods/plant (x4)	0.149	0.105	0.350**	1.000										
Plant height (x5)	0.460**	0.416**	0.124	0.210	1.000									
100-seed weight (x6)	0.376**	0.283*	-0.114	-0.222	0.529**	1.000								
Seed weight/fed (x7)	0.391**	0.278*	0.060	0.362**	0.571**	0.487**	1.000							
No. of seed/plant (x8)	0.154	0.103	0.347**	0.999**	0.220	-0.216	0.370**	1.000						
Seed weight/plant (x9)	0.280*	0.197	0.322**	0.914**	0.421**	0.163	0.537**	0.916**	1.000					
Stem termination (x10)	0.161	0.102	0.191	0.397**	0.578**	0.299*	0.661**	0.403**	0.519**	1.000				
Flower color (x11)	0.034	0.351**	0.330**	0.129	0.052	-0.168	0.050	0.129	0.037	0.109	1.000			
Pubescence color (x12)	-0.196	-0.025	0.037	-0.030	0.112	0.057	0.054	-0.027	-0.008	0.160	0.151	1.000		
Pubescence type (x13)	0.162	-0.016	0.180	0.423**	0.003	0.100	0.182	0.421**	0.475**	0.373**	-0.121	-0.183	1.000	
%Resistance to insect (x14)	-0.417**	-0.258*	-0.038	-0.287*	-0.352**	-0.162	-0.380**	-0.294*	-0.392**	-0.426**	0.021	0.216	-0.355**	1.000

Correlation between pubescence type and resistance percentage to insect cotton leaf worm was found to be negative significant with r value of – 0.355**.The previous results indicate that selection for these characters would improve soybean productivity because of their highly significant correlation with yield .These results are similar to those reported by El-Rassas and El-Rayes (1992), Sharief and El-Bially and Mohamed and Faiza Morsi (2005).

2-Factor analysis

Results of factor analysis are shown in Tables 5 and 6 clearly showed that factors were constructed by applying the principal factor analysis approach to establish the dependent relationship between morphological and yield components in soybean. Factor analysis grouped the studied fourteen characters into four main factors. Factor loadings greater than 0.5 were considered important .Table 6 presents the composition of variables of the four factors with loadings These results are similar to those reported by El-Rassas and El-Rayes (1992) , Sharief and El-Bially (1992) and Ashmawy *et al* (1998)

The results indicated that the four obtained factors explained 71.771% of the total variation in the dependent structure . Factor I accounted for 31.715% of the total variability and included four variables ,i.e. number of branches ,number of pods/plant, number of seed/plant and seed weight /plant .The four variables positively correlated with the factor. These variables had equal importance and high communality with factor I. Therefore ,this factor may be called number of seeds /plant .

Factor II could be regarded as 100 seed weight factor because it contained plant height , 100 seed weight , stem termination and % resistance to cotton leaf worm. This factor was responsible for 16.265%o of the total variation in the dependent structure (Table 6).Three variables of factor II which were plant height , 100 seed weight and stem termination had positive loading while the % resistance to cotton leaf worm had negative loading. The sign of the loading indicates the direction of the relationship between the factor and the variable.

Factor III contained flowering and maturity dates .Factor III was responsible for 14.177% of the total variation in the structure .The two variables positively correlated with the factor. These variables had equal importance and high communality with factor III. Therefore ,this factor may be called number of branches/plant of the dependent structure .Factor I number of seed /plant had high loadings for the included variables (Table 6) The correlation between these variables and factor I is given by the suitable factor loading .Based on the studied genotypes ,selection for number of branches ,number of pods/plant, number of seed/plant and seed weight /plant will enable plant breeders to improve genotypes for higher yield.

Factor IV could be regarded as pubescence color factor because it contained flower color and pubescence color. This factor was responsible for 9.614 % of the total variation in the dependent structure (Table 6).Two variables of factor IV which were flower color and pubescence color had positive loading.

Table 5: Principal factor matrix after orthogonal rotation for all characters of soybean under study.

Variables	Factors				
	Factor1	Factor 2	Factor 3	Factor 4	Communality
Flowering date	0.089	0.340	0.815	-0.182	0.822
Maturity date	0.099	0.113	0.893	-0.007	0.819
No. of branches / plant	0.545	-0.194	0.334	0.256	0.512
No. of pods/plant	0.961	0.110	0.038	-0.053	0.941
Plant height	0.113	0.677	0.436	0.208	0.704
100-seed weight	-0.196	0.706	0.324	0.128	0.659
No. of seed/plant	0.961	0.094	0.027	-0.066	0.937
Seed weight/plant	0.705	0.499	0.167	0.080	0.780
Stem termination	0.395	0.738	-0.073	0.118	0.720
Flower color	0.105	0.063	0.028	0.784	0.630
Pubescence color	-0.032	0.108	-0.131	0.856	0.762
Pubescence type	0.405	0.406	-0.183	-0.417	0.537
%Resistance to insect	-0.121	-0.567	-0.181	0.372	0.508
Factor variance ratio %	31.715	16.265	14.177	9.614	71.771

Table 6.Summary of factor loading for all traits under study.

Variables	Loading	% of total communality	Suggested factor name
Factor 1			
No. of branches	0.545	31.715	No. of seeds/plant
No. of pods/plant	0.961		
No. of seeds/plant	0.961		
Seed weight/plant	0.705		
Factor 2			
Plant height	0.677	16.265	
100-seed weight	0.706		100-seed weight
Stem termination	0.738		
R	-0.567		
Factor 3			
Flowering date	0.815	14.177	No. of branches / plant
Maturity date	0.893		
Factor 4			
Flower color	0.784	9.614	Pubescence color
Pubescence color	0.856		
Commutative variance		71.771	

The results of the current study indicated that the estimated communalities (table 5) were adequate for conclusion since both obtained factors contributed 71.13% to the total variability The results of the factor analysis on soybean and exotic materials from National Gene Bank in Egypt, showed the four factors were required to cover the entire variation present in the genotypes populations. Factor analysis was also able to reveal the yield component, which were related to the morphological characters and the extent of their relationship. The present work has described the results of one such application to quantitative morphological data of diverse genotypes and perhaps indicates factors different from those already reported. Further studies such as these are, however, needed for the exploitation of germplasm collections in a practical breeding context. Sharief and El- Bially came to similar results.

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تقييم بعض التراكيب الو راثية في فول الصويا للصفات المورفولوجية والمحصول ومكوناته وتحليل المحصول

أسعد احمد حمادة*، محمد عبد الرحمن البرعى**، علا احمد مختار الجلالى**، رأفت محمد خلف*، أكرم رشاد مرسى**، إبراهيم حسينى درويش*** ومحمد عبد الحميد خليفة*

* البنك القومى للجينات والموارد الوراثية – قسم المحاصيل الحقلية
** معهد بحوث المحاصيل الحقلية – قسم بحوث البقول
*** قسم المحاصيل –كلية الزراعة – جامعة المنوفية

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بالجميزة خلال الموسمين الصيفيين ٢٠٠٥، ٢٠٠٦ تضمنت ٥٤ تركيب وراثي من فول الصويا من الأصناف المحلية والمستوردات بهدف تقييم هذة التراكيب الوراثية من ناحية، الصفات المورفولوجية والمحصول ومكوناته بالإضافة الى تحديد العوامل المساهمة فى تباين المحصول حيث استخدم لذلك طريقتى الارتباط البسيط وتحليل العامل .

ويمكن تلخيص أهم النتائج المتحصل عليها فيمايلى:

١- أوضحت النتائج أن التراكيب الو راثية Patty , Dekabig ,Sapporo ,Osaka ,Major Hardin ,L86-K-73كانت أبكر في ٥٠% تزهير وتاريخ النضج .

٢- أشارت النتائج الى أن التراكيب الوراثية الستة (جيزة ٣٥ H_1L_{12}, H26z, H_1L_{32}, H_1L_{10}، Hardin كانت مقاومة لدودة ورق القطن حيث كانت اقل نسبة إصابة لدودة ورق القطن فى عشرة للتراكيب الوراثية التالية (جيزة ٢١، جيزة ٨٣، جيزة ١١١،Toano،Major ،-L86, H_2L_{24}, H_2L_{12}, H3z K-73، H_2L_{20}

٣- أظهرت النتائج أن التراكيب الوراثية جيزة ٢١ ، جيزة ٢٢ ، جيزة ١١١ ،Holladay ، Crawford، H_1L_{32} سجلت أعلى القيم للصفات عدد حبوب النبات ، ووزن ١٠٠ بذرة ، ومحصول بذور النبات ومحصول البذور للفدان . ويمكن التركيز على التراكيب الوراثية المبكرة وعالية المحصول والمقاومة لدودة ورق القطن في برامج التربية.

٤- أشارت النتائج الى أن التركيب الوراثي Hardin مبكرة النضج وفى نفس الوقت نسبه المقاومة لدودة ورق القطن.

٥- أظهرت النتائج وجود ارتباط معنوى موجب بين محصول البذور للفدان مع كل من تاريخ التزهير والنضج وعدد القرون للنبات وطول النبات ووزن ١٠٠ بذرة وعدد البذور للنبات ومحصول بذور النبات وطبيعة النمو بينما كان الارتباط سالب ومعنوى بين محصول البذور للفدان ونسبة أكل دودة ورق القطن .

٦- أشارت نتائج تحليل المحصول أن الصفات تحت الدراسة تجمعت فى أربعة عوامل ساهموا بحوالي ٧١,٧٧١ % فى التباين الكلى لمحصول البذور وضم العامل الأول صفات عدد الأفرع للنبات ،عدد القرون للنبات ، عدد بذور النبات ومحصول بذور النبات وساهم بنسبة ٣١,٧١٥% فى التباين الكلى لمحصول البذور وقد ضم العامل الثانى صفات طول النبات ووزن ١٠٠ بذرة وطبيعة النمو ونسبة أكل دودة ورق القطن وقد ساهم بنسبة ١٦,٢٦ % من التباين الكلى لمحصول البذور أما العامل الثالث فقد تضمن تاريخ التزهير والنضج وساهموا بنسبة ١٤,١٧٧ % من التباين الكلى للمحصول والعامل الرابع ساهم بنسبة ٩,٦١٤% فى التباين الكلى للمحصول وتضمن صفة لون الزهرة ولون الزغب .

توصى هذه الدراسة بأنه يمكن إدخال التراكيب الوراثيه التاليه فى برامج التربية وهى جيزة ٢١ ، جيزه٢٢ ، جيزة ١١١ ، Crawford ، Hollady و $H_1 L_{32}$ للحصول على أعلى إنتاجيه من وحده المساحة لمحصول البذور بالأضافه الى مقاومتها لدوده ورق القطن . يجب على مربى النبات أن يضع فى اعتباره الصفات عدد الأفرع للنبات ، عدد القرون للنبات ، عدد البذور للنبات ومحصول البذور للنبات حيث ساهمت هذه الصفات بنسبه ٧١,٧٧% فى كميه المحصول الأجمالى.