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PHENOTYPIC AND AGRONOMIC EVALUATION OF SOME EXOTIC SOYBEAN LINES

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ABSTRACT: ***A Field experiment was carried out at South EL- Tahrir, EL-Beheira Governorate, during 2005 and 2006 summer seasons, with the objective of identifying the morphological characteristics of nineteen soybean exotic genotypes and their reaction to lima bean pod borer, Etiella Zinckenella, compared with the recommended cultivar: Giza111. Results showed that, the highest seed yields per feddan were obtained from 567660B (1.851t/fed.) in the first season and from genotype 567436 in the second season (1.915t/fed.). DR101 genotype was the second in the seed yield over both seasons (1.765 and 1.840 t/ fed. Respectively). On the other hand, the lowest seed yield was obtained from genotype 578471A over both seasons recording 0.860 and 0.988 t/ fed., respectively.***

The studied cultivars significantly differened in all the pervious mentioned traits in both seasons. Dekabig was the earliest genotype in flowering and maturity followed by N 92 – 8231 and giza 111 genotypes, while the latest one in flowering and maturity was 587819 followed by PI416937. The shortest line was Dekabig (39cm) followed by PI416937 and 587619 (56.66 and 56.66 cm) lines. While the tallest one was 574476 C (114.6 cm) followes by 567436 and 587788 A (112.3 and 111.0 cm) lines.

All tested lines have indeterminate stem except PI 416937, Holoday, DR101, and Dekabig which had determinate stem.

Pubescence type induced dense (Giza 111) , sparse (578471A , N587577B, 587619, 567436, and574476c) while the other lines had a normal Pubescence.

The most tolerant genotype to lima bean pod borer was 567660B, where the infestation percentages were 11.33 and 9.66 in 2005 and 2006 growing seasons, respectively.

This genotype belongs to the fifth maturity group having white flowers susceptible line was the most while (578471 tawny, with mean percentage of 66.0 and 60.0 at the two successive seasons.

It refers to the sixth maturity group with white flowers, tawny and sparse Pubescence. It could be concluded that, the high yielding genotype was the most tolerant to Lima bean borer and the low yielding genotype was the most susceptible.

Key Words: ***Soybean, Evaluation, Morphological yield, Lima bean pod borer.***

INTRODUCTION

Soybean, one of the most important legume crops, is grown as a summer crop in Egypt and all over the world for protein and oil production. Evaluation and characterization of introduced genetic materials is necessary in breeding programs to improve the desirable characters through hybridization with the local cultivars for obtaining new hybrids through translocation maturing earliness, high yielding and insect resistance in programs of crops yield improvement. In the Nile Valley and Delta, oil seeds crops represent 1.7% cultivated land, it is not feasible to expand the area for oil seed crops because of high competition with the other summer crops, i.e. cotton, maize and rice. It is, however, feasible, to increase acreage of soybean in newly reclaimed lands. Therefore, at a new area for production, it is necessary to investigate biotic factors that may limit soybean yield. Soybean is susceptible to insects, one of the most harmful insects to soybean crop lima bean pod borer, *Etiella zinckenella* which is wide spread in all soybean fields, especially in the new lands at Nubaria region (Qingling,1980).The larvae of *Etiella zinckenella*It bores and feed on pods. It bores pods and feed on beans after incubation, all stages of larvae are developed within pods until pupation stage .This insect pest causes sever pods damage in soybean in middle and late of podding (kincade *et. al*., 1971). Soybean pod borer, *Etiella* spp. Is one of the most destructive insects on pods and seeds of soybean. The severe damages caused yield loss up to 80%, even 100% of no controlation was applied (Marwoto and Nasir Saleh, 2003).

The two pod borers *Helicoverpa argigera* and *Etiella zinckenella*It are the most destructive insect pests which infest several crops of leguminosae in Egypt , under the conditions of newly reclaimed regions (Gehan and Abdalla 2006).

The objectives of the present work were to characterize some exotic soybean introductions and to study the agronomic performance of these genotypes, along with their reaction to lima bean pod borer under new areas of Beheira governorate.

MATERIALS AND METHODS

A field experiment was conducted in sandy soil at South EL-Tahrir, EL – Beheira Governorate, during 2005 and 2006 Growing seasons. In this experiment, Nineteen soybean exotic genotypes compared with one recommended cultivar: (Giza 111) were arranged in randomized complete block design with three replications (Table 1). The experimental plot area for both seasons was 5.85 M^2 with three ridges, each of 3. 0 m in length and 0.65 m apart. Seeds were inoculated with nitrogen fixing bacteria, *Rhizobium japonicum*, at sowing and sown in hills 20 cm apart on both sides of each ridge at a rate 0f 3- 5 viable seeds per hill to achieve two Seedlings per hill to give a plant population of 150,000 plants per feddan.

Seeds of the studied genotypes were received from North Carolina (USA) by Legume Research Department, Field Crops Research Institute, Agricultural Research Center.

Descriptive codes :

1- Stem termination : Indeterminate , Semi- determinate , Determinate.
2- Flower color :Purble or white.
3- Pubescence color : Tawny , light tawny , or Gray.
4- Pubescence Type : Normal , Sprase Appressed , or Semi- appressed.
5- Pod color : Black , Brown , or Tan.
6- Seed Coat luster : Dull , Shiny , Intermediate , or Bloom.
7- Seed Coat color: Yellow , Green , Gray , Black , Brown , Reddish Brown, Imperfect Black or Buff.

Planting date was May $10^{th}$and 13^{th} in 2005 and 2006 seasons, respectively. Phosphorus fertilizer was added during seed – bed preparation at rate of 15.5kg.

P2 O5 / fedd. In form of calcium superphosphate (15.5 %).

Nitrogen fertilizer was applied in the form of ammonium sulfate 20.6% at rate of 20 unit of nitrogen per feddan after 15 days from sowing. Irrigation was scheduled at 15 day interval after planting. The other cultural practices for growing soybean were conducted properly as recommended by Ministry of Agriculture.

Qualitative traits were visually recorded using scales reported by IBPGR (1984). These characters included seed coat color identification asyellow or green, seed coat luster as dull or shiny, pubescence density as normal, sparse or dense, flower color as white or purple, pod color as brown or gray, stem termination as indeterminate or determinate, Pubescence color as gray or tawny, lodging at harvest as erect, half- erect or prostrate Seed shape as orbicular or rectangular, days from sowing to 50 % of plants with at least one flower, and days from sowing to 95% maturity, maturity group as I, II ,III, IV, V, or VI and hilum color as black, brown, or light brown were recorded. At harvest, ten plants from the two central ridges were randomly taken to measure plant height, number of pods per plant, number of seeds per pod, 100- seed weight and seed weight per plant, while the seed yield per feddan was recorded from all plants of the two central ridges of each plot.

After harvest, 100 seeds were collected randomly from each replicate and checked for lima bean pod borer, *Etiella zinekenella* Collected seeds were kept in paper bags until laboratory examination.

analyzed according to Sendecor and Cochran (1980). Data were statistically

RESULTS AND DISCUSSION

Differences in plant height among studied soybean genotypes were significant in both seasons (Table, 2). The maximum and minimum records

for such trait were obtained from N94– 7781 and Dekabig respectively, in both seasons.

Data in table (2) show significant differences in number of days to flowering and to maturity. There was consistant and well defintrend for such trait in both seasons. The highest (63 days) and the lowest (30 days) estimates for such trait were obtained from 587819 and Dikabig genotypes, respectively, in both seasons. However, number of days to flowering for the remaining genotypes ranged from 35 and 57 days. Maturity of 95 % of pods in all genotypes had the same trend of number of days to flowering, where the late maturing genotype (137 days) was 587819, and the early maturing one was Dekabig.

In conclustion, Dekabig genotype had the lowest estimate for plant height and possessed the lowest number of days to flowering and maturity among the studied genotypes. In addition data in table (2) showed that 587819 genotype recorded the highest number of days to each of flowering and maturity during both seasons.

Table (2): plant height , days from sowing to 50% flowering and days from sowing to 95% maturity of the tested soybeen genotypes during 2005/2006 growing seasons.

Genotypes	Plant height (cm)		Days to50%flowering		Days to 95%maturity	
	2005	2006	2005	2006	2005	2006
471938	77.66	80.33	57.00	56.0	135.0	133.0
578471A	104.6	107.0	57.00	56.0	135.0	132.0
N587577B	99.66	101.3	57.00	55.0	135.0	136.0
587619	65.66	66.66	57.00	56.0	130.0	128.0
587788A	111.0	113.0	57.00	55.0	130.0	134.0
587819	99.00	101.0	63.00	64.0	140.0	137.0
N94-7784	135.6	139.6	55.00	57.0	130.0	132.0
PI416937	56.66	59.66	57.00	57.0	130.0	132.0
Holloday	80.66	83.66	48.00	49.0	125.0	124.0
Hutch	77.00	80.66	50.00	51.0	140.0	139.0
471931	72.00	77.66	50.00	52.0	125.0	125.0
567436	112.3	120.00	57.00	56.0	125.0	124.0
567629A	92.00	102.00	45.00	47.0	125.0	124.0
567660B	80.66	83.33	48.00	47.0	125.0	123.0
574476C	114.6	116.0	45.00	46.0	125.0	124.0
N92-8231	67.33	69.00	34.00	35.0	105.0	103.0
RA-452	91.00	95.33	48.00	47.0	130.0	128.0
DR101	85.66	94.33	50.00	48.0	130.0	132.0
Dekabig	39.00	49.33	30.00	32.0	95.0	94.00
Giza111	84.33	87.66	38.00	39.0	118.0	120.00
$LSD_{0.05}$	6.520	3.700	1.761	1.666	1.278	2.741

Differences in 100 – seed weight among soybean genotypes were significant and insignificant with similar trend in both seasons. The highest 100 seed weight was recorded by DR101 genotype, while the lowest values of this trait were obtained from 587819 genotype in both seasons (Table, 3),

which could be related to the differences of assimilates translocation to seeds among genotypes (Alvarez *et al*., 1994). This explanation can give a reason for DR101 higher 100- seed weight. With ranged to number of seeds / pod, data indicated that soybean plants of N 94-7784 and N92 -8231 genotypes gave the highest number of seeds /pod. While the lowest values of this trait were obtained from Holoday and PI416937 genotypes in both seasons. Differences among genotypes regarding number of pods / plant were reported in both seasons. Genotypes occupied similar trend in their response to environmental effects with superiority of 567660B, followed by 587819 genotype and inferiority of N92- 8231 and PI416937 in number of pods/ plant, respectively to the other genotypes structure. It was noticed that, the increase in number of pods / plant was associated with reduction in or both 100 – seed weight and number of seeds / pod. Inspite of 567660B genotype possessed the lowest number of seeds / pod, it had the greatest pod number/ plant to be in contrast with N92-8231genotype. Explaination towards increasing number of pods/ plant is the reduction of pods abortion which represents the results of better interaction between suitable genotype and surrounding conditions environmental in 567660B.

Table (3): yield and its componenents of the tested soybeen genotypes during 2005/2006 growing seasons.

Genotype	100 Seed Weight (g)		NO. of Seeds/pod		No .of Pods/plant		Seed Weight /plant (g)		Seed Yield /fed (ton)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
471938	15.16	14.81	2.12	2.20	34.66	37.66	11.83	12.72	1.389	1.667
578471A	18.90	17.82	2.08	2.13	26.06	30.53	8.08	9. 31	0.860	0.988
N587577B	16.87	17.64	2.16	2.30	24.46	26.13	8.62	8.83	0.917	1.004
587619	17.70	16.95	2.01	2.00	31.20	33.53	10.27	13.53	1.400	1.675
587788A	17.18	17.61	2.23	2.33	27.06	28.66	9.07	10.01	1.057	1.215
587819	10.93	10.37	2.11	2.23	48.60	53.83	14.48	15.30	1.390	1.409
N94-7784	15.86	15.15	2.61	2.70	39.06	39.66	13.24	13.42	1.562	1.660
P1416937	14.92	15.33	2.01	2.03	2.53	23.00	7.92	8.75	0.933	1.073
Holloday	16.90	16.22	1.83	1.93	45.90	44.93	14.87	15.55	1.588	1.818
Hutch	17.98	17.86	2.46	2.50	28.40	30.86	12.65	14.11	1.309	1.459
471931	16.46	16.02	2.35	2.23	38.26	40.73	13.26	14.84	1.516	1.789
567436	16.08	16.34	2.14	2.26	35.00	38.56	17.78	18.60	1.753	1.915
567629A	17.60	16.47	2.01	2.03	33.00	34.33	12.93	14.43	1.381	1.584
567660B	15.61	15.53	2.05	1.96	52.20	50.33	14.29	16.39	1.851	1.875
574476C	14.60	14.26	2.06	2.06	36.09	48.90	14.59	13.53	1.563	1.636
N92-8231	16.74	15.93	2.61	2.66	20.66	23.60	11.23	13.36	1.062	1.30
RA-452	14.76	14.73	2.08	2.23	38.06	42.00	10.74	11.43	1.315	1.559
DR101	21.50	20.61	2.6	2.00	21.66	23.46	15.77	16.98	1.765	1.840
Dekabig	14.35	13.79	2.48	2.53	35.60	36.00	11.97	12.98	1.117	1.198
Giza111	17.80	2.23	2.23	2.16	23.33	27.93	12.94	16.36	1.209	1.359
$LSD_{0.05}$	0.138	0.138	0.138	0.645	4.290	2.380	1.391	0.930	0.116	0.138

Variations in seed weight/ plant were significant and insignificant during the two seasons. There is a direct relationship between such trait and number of pods/ plant that, the more the number of pods / plant was the greater the seed weight / plant. The maximum and minimum seed weight/ plant were obtained from 567436 and PI416937, respectively. Data in table (3) further indicated the presence of significant and insignificant differences

among all soybean genotypes in seed yield / fed. The seed yield ranged from 0.860 to 1.851 ton/ fed in 2005 season and from 0.988 to 1.915 t / fed. In 2006. The superior genotypes were 567660B, DR101 and 567436, over both seasons, while the least ones were 578471A, N587677B and PI 416937.

The wide variation among all the studied genotypes in all studied traits may be attributed mainly to the wide differences in their genetic make up, which reflected on their response to the environmental growth resources. These results are in accordance with the findings of EL- Atter and Sharaf, (1993); Gastal *et. al,* (1998); Rao and Bhagsari, (1998); Shukla and Vasuniya, (1998); Luquez *et. al,* (1999); Ogburia, *et. al,* (1999); Weilenmann *et. al,* (1999); Atta Allah, (2001) ; and Abdalla, Safia *et. al,* (2004). These findings could be attributed to the differences among the studied cultivars regarding maturity group, therefore, the response of each one to environmental conditions prevailed during growing seasons was governed by genetics factors. This was clearly reflected on the growth characters, consequently yield components and ultimately seed yield.

Data revealed in Table (4) show mean percentages of infestation of tested soybean genotypes with lima bean pod borer *etiella zinckenella*, during 2005 and 2006 growing seasons. Data revealed that the highly tolerant genotype to the lima bean pod borer was genotype 567660B recording 11.33 and 9.66 % infestation during 2005 and 2006 growing seasons, respectively. This genotype was followed by the genotype 567436 with mean percentages values of 19.33 and 16.33 in 2005 and 2006 growing seasons, respectively. On the other hand, 578471A was the most susceptibe genotype to lima bean pod borer with mean infestation values of 66.5 and 60.5 in 2005 and 2006 growing seasons, respectively. This was followed by the genotype 587788A with mean values of 54.66 and 52.0 in both seasons.

Talkar and Lin (1994) and Abdel – Rassoul and Bastawisy (1997) found similar results with the twinty soybean genotypes included in the tests which do not mature at the same time. Moreover, trichome density on pods appeared to influence the level of podborer damage. In beans, Cotton, and Wheat crop varieties with extremely high and extremely low pubescence are reported to be resistant to other insect pests. On the basis of these results and assuming that all other aspects are equal, glabrous soybean cultivars could be highly resistant to limabean podborer (Talkar *et al.* 1988). Talkar and Lin (1994) found that oviposition nonpreference and antibiosis appeared to be the mechanism of limabean podborer resistance in PI227687.

In summary, it can be concluded that the genotypes 567660 B, 567436 and DR101 could be used as source of resistance and yield in crossing programs for improving the commercial cultivars.

Table (4): Mean percentages of infested seeds by Lima pod borer during 2005 and 2006 seasons

Genotypes	% infested seeds	
	2005	2006
471938	31.66[c]	29.33[c]
578471A	66.00[d]	60.00[d]
N587577B	34.33[c]	32.00[c]
587619	34.33[c]	32.00[c]
587788A	54.66[d]	52.00[d]
587819	25.00[b]	22.00[b]
N94-7784	39.00[d]	37.00[d]
PI416937	20.66[a]	18.00[a]
Holloday	28.00[b]	25.66[b]
Hutch	34.33[c]	31.33[c]
471931	25.00[b]	23.00[b]
567436	19.33[a]	16.33[a]
567629A	31.00[c]	29.00[c]
567660B	11.33[a]	9.66[a]
574476C	28.00[b]	26.00[b]
N92-8231	35.00[c]	32.66[c]
RA-452	26.00[b]	23.33[b]
DR101	26.00[b]	24.00[b]
Dekabig	23.33[b]	21.00[b]
Giza111	34.66[c]	32.00[c]
$LSD_{0.05}$	2.51	2.27

a= highly tolerant b= tolerant c= susceptible d= highly susceptible

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التقييم المورفولجى والمحصولى لبعض سلالات فول الصويا المستوردة

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الملخص العربي

أجريت هذه الدراسة خلال موسم ٢٠٠٥ / ٢٠٠٦ فى مزرعة بجنوب التحرير بمحافظة البحيرة وذلك لتقييم وتوصيف بعض التراكيب الوراثية المستوردة من فول الصويا مقارنة بالصنف التجارى جيزة ١١١ مورفولوجيا ومحصوليا لما فى ذلك من أهمية كبيرة قبل إدخالها فى برامج التهجين مع الأصناف المحلية وذلك لتحسين إنتاجية المحصول ونقل الصفات المرغوبة مثل صفات التبكير فى النضج والمحصول العالى والمقاومة للحشرات وخاصة دودة قرون اللوبيا .وقد تم تقييم هذه التراكيب الوراثية فى الاراضى المستصلحة حديثا والتى تمثل المستقبل للتوسع فى زراعات فول الصويا خاصة وأنه يجد منافسة شديدة مع المحاصيل الصيفية الأخرى مثل الأرز والذرة فى أراضى الوادى القديمة.

– وقد تم تقسيم التراكيب الوراثية تحت الدراسة من حيث:

(أ) طبيعة النمو إلى أصناف محدودة وغير محدودة .

(ب) لون الأزهار إلى بيضاء وأخرى بنفسجية.

(جـ) لون الزغب إلى ذات زغب عسلى اللون والأخرى رمادية الزغب

(د) كثافة الزغب إلى ثلاث مجموعات:–

مجموعة ذات زغب كثيف و مجموعة ذات زغب عادى و مجموعة ضعيفة الزغب

(هـ) لون البذور إلى صفراء والأخرى خضراء وثالثة بنى أو بنى فاتح ورابعة خضراء مصفرة .

(و) شكل البذور إلى مجموعتين الأولى مستديرة الشكل والثانية مستطيلة الشكل.

(ز) لون السرة إلى أصناف ذات لون بنى فاتح وأخرى بنى وثالثة ذات لون أسود .

– وقد أوضحت النتائج المتحصل عليها ما يلى:–

– كانت السلالتان 567660B ، 567436 أعلى السلالات فى مقاومة دودة قرون اللوبيا وأن السلالتين 587788A، 578471A هما اقل السلالات تحملا لها .

- أظهرت النتائج أن هناك فروق معنوية بين السلالات المختبرة فى طول النبات حيث كانت السلالة N44-7784 هى أطول السلالات أما أقصرها فكانت السلالة Dekabig
- أما من حيث التبكير فى التزهير والنضج فكانت السلالة Dekabig هى أبكر السلالات جميعها يليها السلالة N92 – 8231 ثم الصنف التجارى جيزة ١١١
- وجد أن الصنف DR101 هو أعلى السلالات فى وزن ١٠٠ بذرة بالجرام
- أما من حيث عدد البذور / قرن فكانت السلالة N94-7784 هى أعلى السلالات
- لوحظ أن أعلى السلالات فى عدد القرون على النبات الواحد كانت السلالة 567660B
- أما بالنسبة لوزن بذور النبات الواحد فكان أعلى سلالتين هما 567436، DR101 على الترتيب
- وجد أن السلالة 567660B ، والصنف DR101 هما أعلى التراكيب الوراثية المختبرة من حيث محصول البذور للفدان بالطن على الترتيب .

وأخيراً نوصى بزراعة السلالة 567660B , والصنف DR101 و السلالة 567436 فى الاراضى الجديدة لمحصولهم العالى ومقاومتهم لدودة قرون اللوبيا والتى تمثل أخطر الحشرات على محصول فول الصويا فى هذه الاراضى.

Table (1): morphological characters of tested soybean genotypes during 2005 and 2006 growing seasons.

Genotypes	Maturity group	Stem Termination	Flower Color	Pubescence Color	Pubescence Type	Pod Color	Seed Coat Color	Seed Coat luster	Seed Shape	Hilum Color	Leaflet Shape	Lodging At Harvest
471938	VI	I	Purple	Gray	Normal	Brown	yellow	Shiny	Obricular	Light brown	Elliptic	Erect
578471A	VI	I	White	Tawny	Sparse	Brown	yellow	Dull	Obricular	Light brown	Elliptic	Prostrate
N587577B	VI	I	White	Gray	Sparse	Light Brown	yellow	Dull	Obricular	Light brown	Elliptic	Erect
587619	VI	I	purple	Tawny	Sparse	Brown	Green	Shiny	Obricular	Light brown	Obricular	Erect
587788A	VI	I	purple	Tawny	Normal	Brown	yellow	Shiny	Obricular	Brown	Obricular	Prostrate
587819	VI	I	White	Tawny	Normal	Brown	yellow	Shiny	Rectangular	Black	Elliptic	Prostrate
N94-7784	VI	I	Purple	Tawny	Normal	Light Brown	yellow	Dull	Obricular	Black	Elliptic	Erect
PI416937	VI	D	Purple	Tawny	Normal	Light brown	Yellow green	Dull	Obricular	Light brown	Obricular	Erect
Holloday	V	D	Purple	Gray	Normal	Gray	yellow green	Dull	Obricular	Black	Elliptic	Erect
Hutch	V	I	White	Gray	Normal	Creamy	Creamy	Dull	Obricular	Light brown	Elliptic	Erect
471931	V	I	White	Tawny	Normal	Brown	Light brown	Shiny	Obricular	Light brown	Elliptic	Erect
567436	VI	I	purple	Tawny	Sparse	Brown	yellow	Shiny	Rectangular	Black	Elliptic	Erect
567629A	IV	I	White	Tawny	Normal	Light Brown	yellow	Dull	Obricular	Black	Elliptic	Erect
567660B	V	I	White	Tawny	Normal	Brown	yellow	Dull	Obricular	Black	Elliptic	Prostrate
574476C	V	I	Purple	Gray	Sparse	Brown	yellow	Shiny	Rectangular	Black	Obricular	Prostrate
N92-8231	III	I	purple	Tawny	Normal	Brown	yellow	Dull	Obricular	Black	Obricular	Erect
RA -452	V	I	White	Gray	Normal	Light brown	yellow	Shiny	Obricular	Black	Elliptic	Erect
DR101	V	D	Purple	Gray	Normal	Light brown	yellow	Shiny	Obricular	Black	Obricular	Erect
Dekabig	I	D	Purple	Tawny	Normal	Brown	yellow	Dull	Obricular	Black	Elliptic	Erect
Giza111	IV	I	Purple	Tawny	Dense	Light Brown	yellow	Dull	Obricular	black	Elliptic	Erect

I=indeterminate **D= determinate**