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EVALUATION OF SOME COTTON VARIETIES TO PIERCING SUCKING INSECTS INFESTATION

Abd El-Salam, M.E. *; H.M.H.Somaa M.A. Khattab**and Amal S.A.Abdel Aly***

*** Cotton Research Institute, Agricultural Research Center- Egypt.**

**** Plant Protection Research Institute- Agricultural Research Center, Egypt.**

ABSTRACT

The present investigation aims to determine the susceptibility of six cotton varieties to piercing sucking insects infestation and relative between yield and yield components with infestation of sucking insect. Six genotypes of cotton were used in this study which namely; Giza 86 (G.86), Giza 88 (G.88), Giza 92 (G.92), Giza93 (G.93), G. 86*10229 and G.84*(G.70*G.51b)* S62 .The results cleared that genotypes mean squares were highly significant for yield and yield components in the two seasons(2012/2013) and combined analysis .Also, genotypes by environments interaction was highly significant for all traits. Also, the means of genotypes were statically different, where the genotypes of 10229 x G.86, G. 92 and Giza 86 recorded the highest values of mean for seed cotton yield and lint percentage and lint index in the first season comparing to their remaining genotypes while, in the second year (2013) the varieties 10229 x G.86, G.92 and (G84*(G70*G.51b)*S_{62}) recorded the highest values of seed cotton yield while, for lint percentage the varieties 10229 x G.86 and G.86 G.93 recorded the highest in this trait. Infestation of piercing-sucking insect, the results cleared that genotypes mean squares were highly significant for *Aphis gossypii*(Golever) ,*Empoasca lybica Beg. and Bemisia tabaci* (Genn) *i*, except for *Nezara viridula L* in the two seasons(2012/2013) and combined analysis .Same trend found in genotypes by environments interaction which was highly significant. Also the Egyptian cotton varieties proved to be susceptible to infestation with the sucking insects significant of genotypes except for *N. viridula* which that varieties were more tolerance. The results cleared that Giza 88 was the lowest population density for the *A. gossypii* and *B. tabaci* ,while the highest number of the two insect existed on variety Giza 86 x10229 Giza ١٢and ((G84*(G70*G.51b)*S_{62}) (Although, the new promising hybrid gave high yield.

Key words: cotton, infestation, sucking insects.

INTRODUCTION

Cotton varieties, which belong to (*Gossypium barbadense L.*) are from among is the most economic agriculture crop in Egypt, where cotton due to its importance as a main cash crop for the industry, and extortion due to its important as one of the most importance fiber crops in the world.

Plant pests are a major factor in the loss of the world's important agricultural crops. About $ many billions is lost every year in the world due to infestations of plants by non-mammalian pests including insects. In addition to losses in field crops, insect pests are also a burden to vegetable and fruit growers, to producers of ornamental flowers, and to home gardeners.

Cotton plants are attacked by a wide rang of sucking insect pests from the seedling stage until maturity .Among the main sucking the plant *Sikka et al.*,1970 stated that a combination of hair on the lamina may provide the index of selection in breeding for resistance to attack by Empoasca sp. *Abou-*

Tour et al., 1989 found that in each cotton season the calculated differences among tested cotton cultivars were insignificant and their susceptibility to main cotton data of both successive seasons were statistically analyzed, the deduced year effect was highly significant indicating

Variations in the recorded infestation levels from year to year. *Khalafalla et al.,* 1997 found that the highest numbers of Aphids existed on cotton variety Giza 83 while, Giza 70 harbored to least number. On the other hand Giza 83 was the least infested variety with jassids and whiteflies which showed the highest affinity to varieties Giza 70 and Giza 85 respectively. Sucking the sap of plant tissues ,virus diseases, transmitted by some of sucking insects, may increase the severity of the injury and reduce the yield (Buttler *et al.*,1986 and Harris *et al.*,1992).the most serious damage to cotton is a result of honeydew excreted by certain sucking insects which makes the lint sticky, resulting in difficulties tin the ginning and spinning process (Perkins 1987 and Shawer 2000).

Chemical control of these insects is expensive and environmentally disruptive and largely ineffective. Therefore, it is strictly to select resistance varieties are one of the simplest and useful tactics in integrated pest management programmers. Therefore, the present investigation aims to determine the relative susceptibility of six cotton varieties to infestation of sucking insect and relative between yield

MATERIALS AND METHODS

In this work six cotton varieties of Egyptian cotton were used to evaluate tolerance and resistance to effect of infestation by the piercing-sucking insects . This research was planted at Sakha Agricultural Research Station, Kafr El -Sheikh, Egypt during the two successive seasons2012 and 2013.

Six genotypes, four varsities of cotton were used in this study which namely; Giza 86 (G.86), Giza 88 (G.88), Giza 92 (G92), Giza 93 (G.93), and two promising hybrids, (G.86*10229) and (G.84*(G.70*G.51b)*S_{62}. These cotton genotypes were planted in a randomize complete block design with three replications, Each cotton genotypes plot consisted of six rows, with four maters long wide, at 70 cm. wide among the rows. The hills were spaced 25 cm. a part in the row. The hills were thinned to two plants after full emergence. All cultural practices were done according to the standard recommendation.

Count of piercing sucking insects(adults and nymphs),the cotton aphis, *Aphis .gossypii* Glover, white fly *Bemisia tabaci* (Genn.), cotton leave hopper .*Empoasc lybica* Beg., and green stink bug, *Nezara viridula* L were recorded on 25 seedling /variety early in the cotton season and on 25 leaves /Varity later on selected at random in each plot.

The chemical pesticides which were used in this experiment for Cotton bollworm were, Pestban (48 % EC) as one liter per feddan, Atabron (5 % EC) as 400 cm.3 per feddan, Teliton (72 % EC) as 750 cm.3 per feddan. All data

was subject to analysis of variance and the least significant differences test (L.S.D.) was used for the comparison between

. Mean values were compared at 0.05 and 0.01 level probability according to L.S.D. range test.

Data were recorded on each cotton variety in the plot for the following traits:

1-Yield and yield components characters were:
2-Lint yield (L.Y. /fedan)
3- Boll weight (B.W) gram
4- Lint percentage (L.P. %)
5- Seed index (S.I.) gram
6- Lint index (L.I.) gram

Estimation the phenotypic correlation coefficients.

Phenotypic correlation (r_{pij}) =
Where :

$$\frac{\sigma_{pij}}{\sqrt{\sigma^2_{pi} \cdot \sigma^2_{pj}}}$$

σ_{pij} = Covariance between characters I and j,
σ^2_{pi} = Variance of the characters I and
$\sigma^2 p_j$ = Variance of the characters j.
Estimation the phenotypic (PCV) and (GCV) variability coefficients.
GCV=(σ_g /X)*100 PCV=(σ_p/ x)*100

RESULTS AND DISCUSSION

Mean performance and analysis of variance and Yield and yield components.

The data presented in Tables 1,2 and 3 indicated that genotypes mean squares were highly significant for yield and yield components in the two seasons and combined analysis . Also, genotypes by environments interaction were highly significant for all traits. The significance of these mean squares indicated presence of genetic variability between these materials. So these genotypes can be used as stocks in breeding programs for some specific traits. Significant of interaction indicated that the evolution of these genotypes under different environments should repeated to correct arbiter on performance of these genotypes, thus these have quantitative nature. Similar results reported by *Yuan el al. 2000 and El Amer et al .2010.*

The results reported that genotypes mean squares were highly significant for the four insects in 2012 and 2013 seasons except for *Nezara Viridula* L. In the 2013 season and for *Empoasca lybica* Beg. in the second

year . The significance of these mean squares indicated presence of genetic variability between these materials and

Table 1). Analysis of variance and the mean square estimates of cotton genotypes for all studied characters in 2012 season.

S.O.V	d.f	Lint Yield	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)	*A. gessypi*	*E. lybica*	*B. .tabaci*	N. viridula
G	5	0.337**	23.5**	4.40**	5.67**	40.89**	235.9**	11.4**	589.2**	0.1936
R	2	0.01341	0.865	0.5739	0.0424	0.84	11.16	4.792	31.52	0.4116
Error	10	0.08353	0.292	0.3072	0.1353	2.47	2.34	1.076	3.13	0.1304

S.O.V). source of variance, (G). genotypes and(R), replication.

Table (2). Analysis of variance and the mean square estimates of cotton genotypes for all studied characters in 2013 season.

S.O.V.	d.f.	Lint Yield	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)	*A. gessypi*	*E. lybica*	*B. .tabaci*	N. viridula
G	5	0.430**	25.0**	2.789**	4.16**	36.8**	7570**	10.09**	15.9**	0.0275
R	2	0.02172	0.078	0.0444	0.0274	19.12	16.6	6.728	0.073	0.2197
Error	10	0.0743	1.189	0.1511	0.1482	3.29	3.5	2.626	0.881	0.1159

S.O.V). source of variance, (G). genotypes and(R), replication.(

Table 3. Combined analysis of variance and the mean square estimates of cotton genotypes for all studied characters obtained from the combined data over both seasons.

S.O.V.	d.f.	Lint Yield	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)	*A. gessypi*	*E. lybica*	*B. .tabaci*	N. viridula
Y	1	45.3**	0.283**	10.7**	11.8**	1.864**	35466**	201809**	119652	20.663**
Error A	4	3.86	0.018	0.471	0.309	0.035	209.5	68.35	147.75	5.1547
G	5	46.74**	0.556**	44.3**	5.73**	8.45**	90202**	28	6695**	3.158
GxY	5	31.0**	0.212**	4.43**	1.464**	1.387**	50781**	360.4	5241**	2.196
Error B	20	3.935	0.079	0.74	0.229	0.142	10035	135.5	1487	4.506

[S.O.V). Source of variance, (Y) year (G). genotypes and(Gxy), interaction (

Table 4. Mean performances of cotton genotypes for yield and its components characters in 2012 and 2013 seasons.

Genotypes	Characters									
	L.y. K/fa	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)	L.y. K/fa	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)
	2012					2013				
G.86	12.44	2.84	39.5	10.2	6.66	9.44	3.02	40.38	9.07	6.14
G.88	7.06	2.46	36.2	8.40	4.77	8.51	2.70	37.33	7.61	4.53
G.92	12.35	2.77	36.73	10.2	5.94	11.4	2.76	36.89	8.66	5.06
10229 G.86	15.0	3.13	39.96	11.4	7.64	12.4	3.66	43.82	10.19	7.96
G93	12.3	3.32	40.57	11.7	7.96	9.32	2.72	38.46	9.04	5.65
G84*(G70*G.51b)*S62	9.26	2.52	33.27	9.60	4.78	10.6	3.25	35.93	10.13	5.68
L.S.D 0.05	2.022	0.372	0.695	0.71	0.473	2.333	0.351	1.403	0.500	0.495
0.01	2.876	0.529	0.989	1.01	0.673	3.319	0.499	1.995	0.711	0.704

Table (5): Mean performances of cotton genotypes for all studied characters in combined analysis.

Genotypes		Characters				
		L.y. K/fa	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)
G.86		10.9	2.93	39.9	9.64	6.4
G.88		7.79	2.58	36.8	8.01	4.65
G.92		11.9	2.77	36.8	9.45	5.5
G.86*10299		13.2	3.49	42.2	10.9	7.96
G.93		10.8	2.93	39.2	10.3	6.65
S62, G.84(G.70*G.51 b)		9.92	2.89	34.6	9.87	5.23
L.S.D.	0.05	2.93	0.440	1.346	0.749	0.589
	0.01	3.20.	0.665	2.036	1.133	0.891

genotypes. Combined analysis the genotypes square were significant or highly significant expect for *E. lybica*. The genotypes x year interaction were highly significant for all insects except for *N. viridula* .Significant and importance of the interaction for most insects indicated that the environment effected on the infections for genotypes, also the evaluation of these genotypes under different environments should be repeated to correct arbiter on performance of these genotype significant of the genotypes reported that some verities were more susceptibility than others.

The data in Table 4 and 5 indicated that the means of genotypes were statically different, where the genotypes of 10229 x G.86, G. 92 and Giza 86 recorded the highest values of mean for seed cotton yield and,. Lint percentage and lint index in the first comparing to their remaining genotypes while, in the second year (2013) the varieties 10229 x G.86, G.92 and (G84*(G70*G.51b)*S_{62}) recorded the highest values of seed cotton yield while, for lint percentage the varieties 10229 x G.86, G. 86 and G.86 and G.93 recorded the highest for this trait . Some trend found in combined analysis. Therefore, the promising hybrid (10229xG.86) which high yield and lint percentage can be using in general culture with Giza 86, but the promising hybrid maximum susceptible to *E.lybia* and *B. tabaci* attack were (58.5 and 143.1) compared with Giza 86 (29.3 and 15.9).

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Significant of genotypes mean squares therefore, mean performance of each Varity for piercing-sucking insects presented in table 6, *A. gossypii*, data, revealed that the number of A. gossypii on Giza86 x 10229 and (G84*(G70*G.51b)*S_{62}) were higher than compared with the rest genotypes while, Giza 88 was the lowest (14.3) in the first season. While, in the second year confirmed that Giza 86 x 10229 hardboard the highest numbers with a mean of 143.0 insects/ 25 seedlings and leaves followed by Giza 92 . On the other hand, the lowest populations were found on Giza 88, Giza 86 and (G84*(G70*G.51b)*S62). Same trend found in the combined analysis.

Regarding *E. lybica*, Giza (G84*(G70*G.51b)*S62) and (G. 86 x 10229) were significantly the most susceptible varieties to infestation with means 22.7 and 21.5, for the first season respectively, on the other hand Giza 88 was the least infested while, in the second year and the combined analysis

the difference between the six varieties were insignificant for this insect. Thus, the mean performance was nearly similar for all varieties.

As for *B.tabaci*, statistical analysis revealed that the differences between varieties were highly significant in 2012, 2013 and combined analysis. G.86 x 10229 and G. 93 and (Promising hybrid (G.84* (G. 70* G 51b)* S62) harbored the highest (58.5, 43.8 and 40.6) and (37.0, 26.7 and 26.7) and combined analysis for the first season respectively, while, the two varieties G.86 x 10229 and G.86 gave the highest susceptible (15.5 and 14.6).

Sikka et al. 1970 stated that a combination of hair on the lamina may provide the best index of selection in breeding for resistance to attack by *Empoasca sp.*

Finally, as a general trend it could be concluded that the Egyptian cotton varieties proved to be susceptible to infestation with the sucking insects except for *N. viridula* which the varieties were of more tolerance.

Also, the results cleared that Giza 88 was the lowest population density for the A. *gossypii* and *B.tabaci*, , while, the highest number of the two insects existed on Varity (G. 86 x 10229) .

The estimates of genotypic and phenotypic variability of coefficients (GCV and PCV) for in the two seasons and combined analysis shown in table 9 the results cleared that PCV and GCV were high and closely for A. *gossypii* and *B.tabaci* . While, were low and closely (10.6 , 9.32) and (31.6 and 21.7) for *E lybia and N.viridula* for PCV and GCV respectively in the first season. In the second season, the PCV and GCV were closely for *A. gossypii* and *B.tabaci* while, they were diversity (25.9 – 15.0) and (28.9-6.0) for *E.lybica* and *N.Viridula* for PCV and GCV respectively. On other hand the estimates of PCV and GCV in combined analysis cleared that there were difference between PCV and GCV (80.3 – 52.2 , 15.0 – 0.0), (30.3 – 14.3) and (17.63-5.92) of *A.gossypii*) *E. lybica, B.tabaci* and *N. viridula* for PCV and GCV, respectively. The difference between PCV and GCV due to the presence of genotype x environment interaction and the large the environmental effect on the behavior the varieties of susceptibility for piercing sucking insects infestation Abou-Tour 1986 and Abou-Tour *et al.*, 1989 found that in each cotton season the calculated differences among tested cotton cultivars were insignificant and their susceptibility to main cotton insects were approximately the same but when the combined date of both successive seasons were statistically. Analyzed, the deduced year effect was highly significant indicating variation in the recorded infestation levels from year to year .PCV and GCV coefficients Variability cleared that the values of the two parameters was high in the first and second compared with combined analysis for yield and yield components especially for boll weight and lint yield / fed. Which were i.e. (30.5, 33.4) , (32.5-37.0) and (14.4-23.11) for first, second season and combined analyses of GCP and PCV , respectively for lint yield. Also, the results cleared that in the two years PCV and GCV values were closely while in combined analysis there is difference between them . Due to the increase the genotype by environment interaction .

Table 6. Mean number of piercing- sucking insects(adults and nymphs) per 25 leaf on some cotton varieties during 2012 and 2013 seasons and combined analysis.

Verities	2012				2013				Combined			
	A. gessypii	E. lybica	B. tabaci	N. viridula	A. gessypii	E. lybica	B. tabaci	N. viridula	A. gessypi	E. lybica	B. tabaci	N. viridula
Giza 86	19.10	23.6	29.30	1.79	14.60	15.90	19.1	1.33	18.8	14.9	21.9	1.56
Giza 88	17.20	14.3	17.30	1.53	10.70	15.40	17.2	1.17	14.9	13.9	13.9	1.35
Giza 92	19.10	28.0	35.60	1.53	11.20	47.90	19.1	1.70	37.9	14.0	23.3	1.30
Giza 93	20,10	23.0	43.80	1.26	6.56	23.00	20.1	1.22	26.2	14.8	26.7	1.24
G.86x10229	21.50	41.1	58.50	1.37	15.50	143.1	21.5	1.11	92.1	14.7	37.0	1.24
G.84*(G.70*G.51 b)	22.70	29.3	40.60	1.95	11.90	19.10	22.7	1.17	25.1	15.7	26.3	1.56
LSD.05	2.78	1.89	3.22	NS	2.95	4.07	1.50	ns	6.6	NS	2.40	NS
LSD.01	3.96	2.68	4.58	NS	4.2	5.79	2.13	ns	9.1	NS	3.27	NS

Correlation coefficient was estimated between studied yield and yield components and numbers of sucking insects presented in Table 7. As shown in the table, the values of correlation coefficient were positively highly significant between seed cotton yield and *E. lybica* and *B.tabaci*. Also, some trend was found between (*E. lybica* and *B.tabaci*)

El-Mezayyen *et al.*, 2006 found that the highest numbers of Aphids existed on cotton Varity Giza 86, while Giza 89 and Giza 70 harbored the least numbers .On the other hand, Giza 45 and Giza 89 were the least infested varieties with white flies and Jassids which the highest affinity to varieties Giza 89 and Giza 86 respectively.

Table 7. Genotypic and phenotypic coefficient of variability (GCV and PCV) for cotton genotypes for yield and its components characters and susceptible to infestation with the sucking insects in 2012 and 2013 seasons.

	2012		2013		com	
	GCV	PCV	GCV	PCV	GCV	PCV
A.gossypii	31.6	32.1	35.9	36.3	52.2	80.3
E.lybica	9.32	10.6	15.0	25.9	-	15.3
B.tabaci	37.2	38.1	18.4	19.6	14.3	30.3
N.viridula	21.7	31.6	-	28.9	5.92	17.63
Boll Wight	10.2	14.4	11.4	14.6	8.17	12.6
Lint percentage	7.41	7.53	7.28	7.8	6.73	7.1
Seed index	11.4	12.6	10.29	11.14	8.7	10.0
Lint index	21.6	22.4	19.8	20.9	17.9	18.9
Seed cotton yield	30.5	33.4	32.5	37.0	14.4	23.1

and (*E.lybica* and *N.viridula*). Therefore, the increase of number of insect of the variety but seed cotton yield was high. Muhammad *et al.*, (2013) found that variety N. Karishma which high number of white fly (0.79) per leaf but it gave the high yield (8.53 kg/30m^2) compare with variety N. 77 which gave low number of white fly per leaf (0.45) and gave low yield 6.50 kg / 30 m^2.The test material appearing maximum susceptible to white fly attack

was N-Karishma (0.79 per leaf) at farm level. The reduction in white fly attack was especially more pronounced in N-777, showing 0.45 per leaf incidence compared to other respective germplasms. The N-Karishma carried minimum jassid load considering the best for pest resistance (1.70 per leaf) in comparison to other varieties. The pest increase was more pronounced in the sensitive genotypes N-777, Sitara-10 M and N-9811, and incidence was observed at a level of 2.17, 2.20 and 2.25 per leaf, respectively.

Finally, as a general trend it could it be clouded that the Egyptian cotton varieties proved to be susceptible to infestation with the sucking insects except for *N.virduale* which the varieties were more tolerance. Also, the results cleared that Giza 88 was the lowest population density for the A. *gossypii* and *B.tabaci* .while the highest number of the two insect existed on Varity Giza 86 x10229. Although, the new promising hybrid gave high yield.

Table (8): The correlation coefficients among all studied characters.

Traits	L.y k/fad	B.W. (g)	L.P. %	S.I. (g)	L.I. (g)	A. gossypii	E. lybica	B. tabaci
BW. (g)	0.50**							
L.P. %	0.46**	0.61**						
S.I. (g)	0.72**	0.533**	0.336*					
(L.I. (g)	0.73**	0.697**	0.803**	0.828**				
A.gossypii	-0.113	-0.181	0.04	-0.119	-0.065			
E. lybica	0.35**	-0.082	-0.108	0.582**	0.305	-0.308		
B. tabaci	0.305	-0.031	0.093	0.528**	0.38*	-0.038	0.833**	
N .viridula	0.47**	0.112	0.092	0.43*	0.33*	-0.197	0.431**	0.29

***and ** significant and highly significant**

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تقييم بعض أصناف القطن للإصابة بالآفات الثاقبة الماصة

محمد عزت عبد السلام * ،حسن محمد حسن صومع **،محمد عبد الحافظ خطاب **و أمل سامي على عبد العال *

*** معهد بحوث القطن – مركز البحوث الزراعية – مصر**

**** معهد بحوث وقاية النبات – مركز البحوث الزراعية – مصر**

اجري هذا البحث لمزرعة محطة البحوث الزراعية بسخا – خلال موسمي ٢٠١٢- ٢٠١٣م . لدراسة مدى الإصابة بعض أصناف القطن والهجن المبشرة وكانت الأصناف المدروسة حيزه ٨٦ ، جيزة ٨٨ ، جيزة ٩٢ ، جيزة ٩٣ وهجن مبشره هما جيزة ٨٦ X ١٠٢٩٩ ، وهجين (جيزة ٨٤ X (جيزة ٧٠ X جيزة ٥١ ب) س ٦٢للاصابة بالحشرات الثاقبة الماصة.

وأضحت النتائج انه توجد اختلافات ما بين التراكيب الوراثية بين المحصول ومكوناته في موسمي الزراعة في التحليل المجمع واتضح من النتائج معنوية التفاعل بين البيئة والوراثة لصفات المحصول ومكوناته . وكذلك كان الصنف (٨٦ X ١٠٢٩٩) ، جيزة ٩٢ وجيزة ٨٦ سجلت اعلي القيم في المحصول ومعدل الحليج ومعامل الشعر بالمقارنة بباقي التراكيب الوراثية في الموسم الأول في حين سجلت التراكيب الوراثية (جـ ٨٦ X ١٠٢٩٩) ، جيزة ٩٢ والهجين (جيزة ٨٤ X (جيزة ٧٠ X حيزه ٥١ ب) س ٦٢) اعلي القيم في المحصول في الموسم الثاني .

وأوضحت النتائج أن هناك اختلافات معنوية أو عاليه المعنوية ما بين التراكيب الوراثية والإصابة بالآفات الثاقبة الماصة(من القطن ونطاط أوراق القطن وذبابة القطن البيضاء) في كلا الموسمين عدا الإصابة بالبقة الخضراء والجا سيد في الموسم ٢٠١٣ بينما كان التفاعل ما بين التراكيب الوراثية و البيئة معنويا للإصابة لجميع الحشرات الثاقبة الماصة عدا الإصابة بالبقة الخضراء . وأوضحت النتائج أن اقل تعداد حشري لمن القطن وجد علي أصناف جيزة ٨٨ وجيزة ٨٦ في حين كان اعلي تعداد حشري كان مع الصنف (جيزة ٨٦ X ١٠٢٩٩) و الصنف جيزة ٩٢) في كلا الموسمين . أما بالنسبة للإصابة بحشره الذبابة البيضاء وأوضحت أن النتائج أن اعلي تعداد كان علي الأصناف (جيزة ٨٦ X ١٠٢٩٩) وجيزة ٩٣ و الهجين ((جيزة ٨٤ X (جيزة ٧٠ X جيزة ٥١ ب) س ٦٢) واقل تعداد لها على الصنف٨٨ فى كلا الموسمين أما بالنسبة لحشره البقة الخضراء فكانت الأصناف متشابها إلي حد كبير جدا والاختلافات غير معنوية. ام بالنسبة لحشرة الجاسيد لم تختلف الأصناف في نسبة الإصابة .