

SUSCEPTIBILITY OF SIX EGYPTIAN COTTON VARIETIES TO INFESTATION WITH BOLLWORMS

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ABSTRACT: *The susceptibility of six varieties of Egyptian cotton plants (G 45, G 70, G 85, G 86, G 83 and G 89) to the infestation with pink bollworm, Pectinophora gossypiella (Saund.) and spiny bollworm, Earias insulana (Boisd.) was studied during 2001 and 2002 seasons under field conditions. The results obtained clearly indicated that the varieties G 89 and G 45 were the most tolerant varieties to infestation by pink bollworm and spiny bollworm while G 85 and G 70 were highly susceptible varieties.*

Key Words: *Cotton, Earias insulana pink bollworm, spiny bollworm, Pectinophora gossypiella, susceptibility,*

INTRODUCTION

The cotton plant *Gossypium barbadense* (Linn) is one of the most important crop in Egypt, for its effect on the national economy. About million feddans are cultivated annually, yielding around seven million Kentars. (Kentar = 157.5 Kg.). Cotton is subjected to be attacked by several insect pests which cause serious damage to the crop in both quantity and quality. The most important insect pests are the spiny bollworm *Earias insulana* (Boisd.), and the pink bollworm, *Pectinophora gossypiella* (Saund.), (Hassanein, et al., 1992).

As a result to the harmful effects of chemical control by pesticides, all efforts are directed these days to reduce the harmful effects of chemical control using another means of pest control as; natural enemies, microbiological and I.P.M control. There is new trend to use plant defense mechanisms, to create a balance between the insect and the host plant by cultivating varieties which show certain level of resistance to infestation by the pests.

Painter (1951) distinguished three major forms of plant resistance to insects: non-preference, anti-biosis and tolerance. Non-preference refers to the form of resistance that collectively protects the plant from insect attack by inhibiting the insect from selecting a particular plant for food, shelter or oviposition. On the other hand, anti-biosis refers to the plants' ability to disrupt the normal functions of insect life. This disruption is usually manifested in the form of reduced fecundity, reduced size of both adults and/or immature stages or death. The third form of plant resistance is tolerance and refers to the plants' ability to recover after insect pest attack (Baliddawa, 1973). Non-preference, anti-biosis and tolerance are heritable characteristics

end constitute "true" resistance .However , certain conditions may render a potentially susceptible plant species resistance to insect attack . This what Painter (1951) referred to as pseudo-resistance.

The susceptibility of cotton varieties to the attack of insect infestation may be due to certain physical, physiological and chemical factors or it may be a complex interrelationship that is not clearly understood (Hassnian *et al.*, 1992).

Therefore, the aim of the present work was to study the susceptibility of six varieties of cotton plants (Giza 89, 86, 83, 70, 45 and 85) to natural infestation by the cotton bollworms, *P. gossypiella* and, *E. insulana*

MATERIAALS and METHODS

Field experiments were conducted during both seasons of 2001 and 2002 in the experimental farm of the Faculty of Agriculture, Minufiya University. A complete randomized block design with three replicates was followed. Each plot had an area of about 8/1000 fedan. The tested cotton varieties were Giza 45, Giza 83, Giza 86, Giza 89, Giza 85 and Giza 70. The planting date was 20 th March in both seasons .The normal agricultural practices were followed and no pesticidal treatments were applied through the experimental period. The mean pests infesting the tested varieties were *Pectinophora gossypiella* and *Earias insulana* .

Assessment of cotton varieties infestation by *P. gossypiella* and *E. insulana* (Lepidoptera:Noctuidae).

This study was conducted in two successive cotton seasons ,2001 and 2002 to estimate the percentage of natural infestation of the above mentioned cotton varieties by *P. gossypiella* and *E. insulana*. The same previous area was used to estimate the natural infestation by the bollworms for each variety by recording the damage in the bolls on the plant and shedding bolls .Samples of 50 bolls of each plot for each variety were picked randomizely from different levels of plant height. There are three replicates for each variety. These samples were taken regularly twice monthly at the beginning of July up to the end of September.

Statistical analysis

The obtained results were subjected to the analysis of variance test (ANOVA) with mean separation at 5% level of significance by LSD test according to Snedecor and Cochran (1973) and Duncan's multiple range test were used as described by Fisher (1944).

RESULTS AND DISCUSSION

1.Susceptibility of cotton varieties to infestation with bollworms:

1.1. Susceptibility of cotton varieties to infestation with pink bollworm, *Pectinophora gossypiella*:

The attained results are summarized in tables (1 & 2) and Fig.(1), showing the monthly percentages of green bolls infestation in 2001 and 2002 seasons

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respectively. Data obtained clearly indicated that pink bollworm infestation in green bolls during the two seasons 2001 and 2002 varied according to the cotton variety. The highest percentage of infestation was 40.82, on G 70 followed by 32.80 on G 85, 24.71 on G 83, 24.44 on G 86 and 22.73 on G 45. The lowest percentage of infestation was 19.77 on G 89 during 2001. In 2002, the highest percentage of infestation was 37.73 on G70 followed by 29.44 on G 85, 23.44 on G 86, 22.78 on G 83 and 20.51 on G 45, however the lowest percentage of infestation was 20.22 on G 89.

The average percentages for the two seasons together were calculated indicating that the highest infestation was 39.27 on G 70 followed by 31.12 on G 85, 23.94 on G 86, 23.75 on G 83 and 21.62 on G 45, but the lowest infestation was 19.99 on G 89. Thus results could be grouped into three categories:

- a-highly susceptible group including G 70 and G 85 .
- b-moderately susceptible group including G 83 and G 86 .
- c-lightly susceptible group including G 45 and G 89.

The variety G 89 seemed to be more resistant against the infestation with pink bollworms.

These findings come in disagreement with those found by Nassef, and Aref (2004) who mentioned that Giza 89 cotton variety was more susceptible to infestation by *P. gossypiella* than Giza 86 cotton variety at Kafr El-Sheikh Governorate during 2002 and 2003 seasons.

Table (1): Green bolls infestation by the pink bollworm *P. gossypiella* during 2001 and 2002 seasons.

Dates	% INFESTED COTTON BOLLS					
	COTTON VARIETIES					
	G 86		G 89		G 45	
	2001	2002	2001	2002	2001	2002
July	22.21	24.21	20.20	22.11	22.30	20.20
August	24.20	23.12	18.33	21.00	24.21	22.10
September	26.03	22.10	20.23	16.10	21.21	18.20
Mean	24.44	23.44	19.77	20.22	22.73	20.51
Average	23.94		19.99		21.62	
Dates	G 85		G 70		G 83	
	2001	2002	2001	2002	2001	2002
July	36.30	32.11	42.50	38.41	22.20	24.15
August	29.40	26.21	38.21	34.31	25.31	22.32
September	32.10	29.12	41.11	39.01	26.20	20.31
Mean	32.80	29.44	40.82	37.73	24.72	22.78
Average	31.12		39.27		23.75	

Hassanein *et al.* (1969) and Abd El- Rahim *et al.* (1979) found that Giza 45 and Giza 70 were the most susceptible varieties to bollworm infestation. The results of Abdel-bary *et al.* (1980) indicated that except for the hairy strain

Bahtim 101, all Egyptian cultivars are highly susceptible to bollworm infestation and okra leaf, lack of nectaries, smooth leaf and high gossypol content were found to be correlated with resistance to *P. gossypiella*, while dense leaf pubescence and low gossypol content were correlated with susceptibility to the pest.

Table (2): Effect of different cotton varieties on the infestation percentage of pink bollworm.

Variety	Season (2001)			Season(2002)		
	Mean \pm S.E	S.D	Group.	Mean \pm S.E	S. D	Group
G 86	24.44 \pm 1.19	1.69	c	23.44 \pm 0.56	0.79	c
G 89	19.77 \pm 0.77	1.08	d	20.21 \pm 1.78	2.51	c
G 45	22.73 \pm 1.01	1.42	cd	20.51 \pm 1.19	1.67	c
G 85	32.80 \pm 2.02	2.8 [^]	b	29.44 \pm 1.79	2.54	b
G70	40.82 \pm 1.05	1.48	a	37.73 \pm 1.51	2.01	a
G 83	24.72 \pm 1.19	1.68	c	22.78 \pm 1.1 ^o	1.63	c
Average	27.55 \pm 1.21			25.69 \pm 1.33		

(F) value for variety (2001) = 38.0279 (significant at 0.05) and L.S.D =3.89

(F) value for variety (2002) = 23.0642 (significant at 0.05) and L.S.D =4.32

(Values followed by the same letter are not significant different).

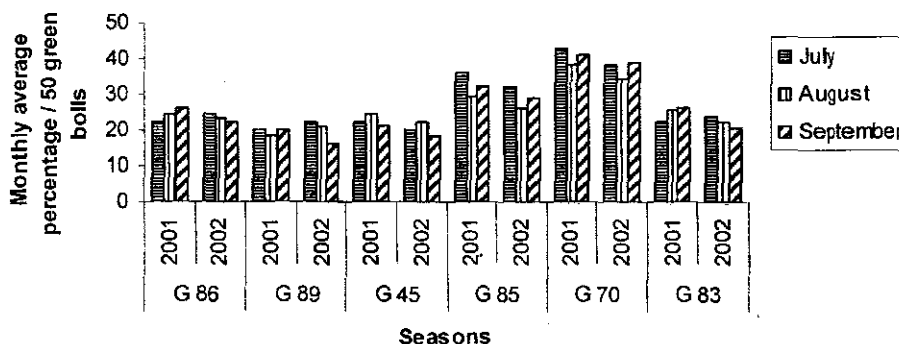


Fig. (1) : Monthly average percentages of pink bollworms infesting green bolls of different cotton varieties at Shibin EL-Kom region during 2001 and 2002 seasons .

1.2. Susceptibility of cotton varieties to infestation with spiny bollworms , *Earias insulana* :

The attained results are summarized in tables (3 &4) as well as Fig.(2), represented by the percentages of green bolls infestation in 2001 and 2002 seasons, respectively. Data given in table (4) clearly indicated that spiny bollworm infestation in green bolls during the two seasons varied according to the cotton variety. The highest percentage of infestation during 2001 was

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34.82, on G 70 followed by 35.73, on G 85, 23.26 on G 83, 24.96 on G 86 and 23.09 on G 45. The lowest percentage of infestation was 22.46 found on G 89 during 2001 season. Data given in tables (3) and (4) clearly indicated that the highest percentage of infestation was 37.47, on G 70 followed by 32.44 on G 85, 25.7 on G 86, 24.46 on G 89 and 24.31 on G 83, but the lowest percentage of infestation was 23.97 found on G 45 during 2002 season.

The average percentages for the two seasons together showed that the highest infestation was 36.15 found on G 70 followed by 34.09 on G 85, 25.33 on G 86, 23.79 on G 83 and 23.53 on G 45, but the lowest infestation was 23.46 found on 89. Thus results could be grouped into two categories:

- a- highly susceptible group including G 85 and G 70 .
- b- lightly susceptible group including, G 45, G 86 , G 83 and G 89.

The variety G 89 seemed to be more resistant against the infestation with spiny bollworm, the other tested varieties were high and moderate susceptible.

These findings come in disagreement with those found by Aref *et al.* (2004) who found that Giza 88 cotton variety was the most tolerant variety to infestation by the spiny and the American bollworms. Giza 89 was the most susceptible variety to infestation by the spiny bollworm, whereas Giza 85, Giza 86 and Giza 89 were the most susceptible varieties to infestation by the American bollworm at Kafr El-Sheikh Governorate during 2002 and 2003 seasons. Meanwhile, Abu-El-Nasr (1960) reported that no significant differences were found between the rates of spiny bollworm infestation on six cotton varieties. Tang and Wang (1996), reported that gossypol, tannin and oil gland contributed the greatest components to cotton resistance against the attack by American bollworm, spiny bollworm and, with total sugar and total protein contents of secondary importance .

Table (3): Green bolls infestation by the spiny bollworm *E. insulana* during 2001 and 2002 seasons.

Dates	% INFESTED COTTON BOLLS					
	COTTON VARIETIES					
	G 86		G 89		G 45	
	2001	2002	2001	2002	2001	2002
July	28.32	26.10	24.21	22.22	22.04	26.32
August	24.41	22.50	22.12	26.11	25.03	23.53
September	22.22	28.10	20.12	23.12	21.02	22.12
Mean	24.96	25.70	22.46	24.46	23.09	23.97
Average	25.33		23.46		23.53	
	G 85		G 70		G 83	
	2001	2002	2001	2002	2001	2002
July	34.40	36.10	36.20	38.13	26.00	24.20
August	34.21	32.11	36.31	34.23	20.14	22.11
September	37.12	28.22	32.31	39.10	23.12	24.00
Mean	35.73	32.44	34.82	37.47	23.26	24.31
average	34.09		36.15		23.79	

Table (4): Effect of different cotton varieties on the infestation percentage of spiny bollworm.

Variety	Season (2001)		Season (2002)		average	Group
	Mean \pm S.E	S. D	Mean \pm S.E	S. D		
G 86	24.96 \pm 1.85	2.61	25.70 \pm 1.69	2.3 ^A	25.33 \pm 1.77	b
G 89	22.46 \pm 1.02	3.69	24.46 \pm 1.25	3.3 ^A	23.46 \pm 1.14	b
G 45	23.09 \pm 1.54	5.22	23.97 \pm 1.14	4.7 ^A	23.53 \pm 1.34	b
G 85	35.73 \pm 0.86	7.38	32.44 \pm 2.17	6.75	34.09 \pm 1.52	a
G70	34.82 \pm 0.88	10.44	37.47 \pm 1.49	9.55	36.15 \pm 1.19	a
G 83	23.26 \pm 1.60	14.76	24.31 \pm 0.72	13.49	23.79 \pm 1.16	b
Average	27.37 \pm 1.29		26.06 \pm 1.41			

(F) value for varieties of 2001 and 2002 together = 33.30 (significant at 0.05)

L.S.D =3.48 (Values followed by the same letter are not significant different).

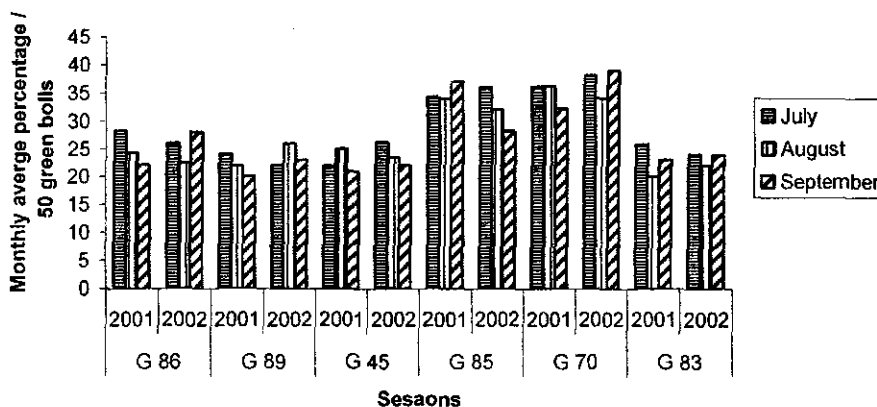


Fig. (2) : Monthly average percentages of spiny bolifworms infesting green bolls of different cotton varieties at Shibin EL-Kom region during 2001 and 2002 seasons .

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حساسية ستة أصناف من القطن المصري للإصابة بديدان اللوز

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الملخص العربي

أجريت هذه الدراسة لتقدير حساسية ستة أصناف من القطن المصري و هي الأصناف جيزة ٤٥ - جيزة ٧٠ - جيزة ٨٥ - جيزة ٨٦ - جيزة ٨٣ - جيزة ٨٩ للإصابة بديدان اللوز القرنفلية و الشوكية خلال مرحلة النمو الزهري و الثمري تحت الظروف الحقلية خلال موسمي ٢٠٠١ و ٢٠٠٢ في مرزعة كلية الزراعة بشبين الكوم محافظة المنوفية . بالنسبة لديدان اللوز القرنفلية فقد أوضحت النتائج أن نسبة الإصابة تختلف علي حسب الصنف حيث لوحظ أن اعلي نسبة إصابة كانت (٤٠,٨ % و ٣٧,٧ %) و ذلك في الصنف جيزة ٧٠ و كانت أقل نسبة إصابة هي (١٩,٧٦٦ % , ٢٠,٢١٧ %) على الصنف جيزة ٨٩ خلال الموسمين . ام بالنسبة لديدان اللوز الشوكية فقد أوضحت النتائج أن اعلي نسبة إصابة كانت (٣٥,٧٢٨ % و ٣٢,٣٤٥ %) و ذلك في الصنف جيزة ٨٥ و (٣٤,٨٢٤ % و ٣٧,٤٦٦ %) على الصنف جيزة ٧٠ و كانت أقل نسبة إصابة هي (٢٢,٤٥٩ % و ٢٤,٤٥٥ %) على الصنف جيزة ٨٩ و (٢٣,٠٩ % و ٢٣,٩٧٣ %) على الصنف جيزة ٤٥ خلال الموسمين . و بالتالي فقد أظهرت النتائج أن الصنف جيزة ٨٩ و جيزة ٤٥ كانا أقل الأصناف إصابة بديدان اللوز القرنفلية و الشوكية أما الأصناف جيزة ٨٥ و جيزة ٧٠ كانا أكثر الأصناف إصابة أو أكثر الأصناف حساسية للإصابة بتلك الآفات .