

## IMPACT OF VARIETIES ON INFESTATION OF COMMON BEAN PLANTS WITH PESTS

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### Abstract

This work was conducted during 2007 and 2008 summer season to evaluate three varieties of common bean for their relative susceptibility to spider mites, *Tetranychus urticae*, *Tetranychus cucurbitacearum* and whitefly, *Bemisia tabaci* as well as Thrips, *Thrips tabaci* and its effect on the resultant yields. The result revealed that Paulista variety was the best treatment (recorded the least infestation and the heaviest green pods yield).

### INTRODUCTION

Leguminous vegetable plants are considered the most important crops which used as human food, because of its nutritive for human as well as its provision with vitamins and mineral salts. Common bean plants are known to be one of the popular leguminous vegetables which used as food in Egypt.

During the recent years, the cultivated area of this crop had noticeably increased to cover the needs of people and the requirement of Arabia's and foreign markets for export purpose to increase the national income.

As a result of the expansion of cultivated vegetable crops the problems of insect pests have been increased in the last years.

Leguminous vegetable plant, common bean, *Phaseolus vulgaris* L. is subjected to attack by a large number of insect pests throughout the growing seasons mainly, homopterous insects, whitefly, *Bemisia tabaci*, thrips, *Thrips tabaci* and the two spotted spider mites, *Tetranychus urticae*, *Tetranychus cucurbitacearum*, aphids, leaf miners and jassids, because of its highest leaf nitrogen levels which encourage pest development, increased egg production and their longevity (Braikel and Post, 1959) which threaten both quality and quantity of the resultant yield and cause serious damage either directly by sucking plants juice or indirectly as vectors of virus diseases.

The present study was carried out as a trial to shed light on some aspects including varieties susceptibility of common beans pests' infestation and also on its crop yield.

## MATERIALS AND METHODS

A field experiment was carried out throughout two successive years (2007 and 2008) at two summer plantations in the experimental farm of the Faculty of Agriculture, Moshtohor, Qalubia Governorate.

This experiment was conducted to evaluate the susceptibility of three different varieties of common bean, *Phaseolus vulgaris* L. (Bronco, Xera and Paulista) to the infestation of four sap sucking pests, *Tetranychus urticae* Koch, *T. cucurbitacearum*, (Sayed), *Bemisia tabaci* (Genn.) and *Thrips tabaci* (Lind.). The experimental area was about 0.216 feddan and the design was split plot arrangement with three replicates for each experiment where, the treatments in each accurred the main plots and the inspection dates ranked in the sub plots. Normal agriculture practices were followed except for keeping the whole area free from any pesticides. The green pods of common bean of each variety were collected and weighted to estimate the final yield.

### Plant samples

Sampling started four weeks after sowing and continued weekly for 10 weeks in the two experiments. Ten leaflets from each replicate were randomly picked up from different levels of plant, and then kept in tightly closed paper bags to be transferred to the laboratory for inspection by the aid of a stereomicroscope.

All the individuals "eggs, mobile stages" of the *Tetranychus urticae*, *T. cucurbitacearum*, *Bemisia tabaci* "egg, nymph and pupa stages" and *Thrips tabaci* "nymph & adult stages" were estimated by counting the total numbers on both lower and upper surfaces of leaflet. Adults of *B. tabaci* were counted on 10 plants / replicate in the morning before sunrise when adults were more stable

### Statistical analysis

Analysis of variance for each experiment as a split plot design with three replicates according to the method described by Gomez and Gomez (1984) was used. The back word regression analysis method was performed with the Program Proc. Reg. of SAS (SAS Institute Inc., 1988).

## RESULTS AND DISCUSSION

### The Effect of Common Bean Varieties on Infestation levels rates by Four Sap Sucking Pests

#### 1- The two spotted spider mite, *Tetranychus urticae*

- a) **In 2007 season:** Data obtained in Table (1) show the infestation levels by the two spotted spider mite, *T. urticae* (eggs, mobile & total stages) to three different common bean varieties throughout 2007 season.

Table 1. Mean count of the two-spotted spider mite, *Tetranychus urticae*, eggs, moving stages and total population / leaflet of common bean varieties at Moshtohor, Qalubia Governorate during 2007 season.

stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Egg	Bronco	24.27	91.00	36.80	18.73	22.90	41.33	22.63	8.87	5.57	3.27	27.54	275.37
	Xera	9.93	72.70	15.00	16.93	15.27	1.80	12.30	8.07	7.50	3.57	16.31	163.07
	Paulista	6.70	4.53	6.40	13.47	15.17	7.03	19.27	3.57	3.77	3.13	8.30	83.03
	Mean	13.63	56.08	19.40	16.38	17.78	16.72	18.07	6.83	5.61	3.32	17.38	173.82

LSD 5% for:

Varieties	14.02
Inspection date	11.71
Interaction	NS

stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Mobile	Bronco	3.83	26.33	17.46	8.47	10.77	47.00	13.13	7.40	2.57	3.97	14.09	140.93
	Xera	2.63	5.93	7.74	6.77	6.57	2.83	7.03	5.73	4.20	1.60	5.10	51.04
	Paulista	1.50	0.77	2.27	2.03	8.27	9.97	7.93	3.47	2.17	2.07	4.04	40.43
	Mean	2.66	11.01	9.16	5.76	8.53	19.93	9.37	5.53	2.98	2.54	7.75	77.47

LSD 5% for:

Varieties	7.37
Inspection date	6.30
Interaction	10.91

stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	28.10	116.53	54.03	27.20	33.67	88.33	35.77	16.27	8.13	7.23	41.53	415.27
	Xera	12.57	78.63	22.70	23.70	21.83	4.63	19.33	13.80	11.70	5.17	21.41	214.07
	Paulista	8.20	5.30	8.67	15.50	23.43	17.00	27.20	7.03	5.93	5.20	12.35	123.47
	Mean	16.29	66.82	28.47	22.13	26.31	36.66	27.43	12.37	8.59	5.87	25.09	250.93

LSD 5% for:

Varieties	22.83
Inspection date	16.60
Interaction	28.75

Bronco was the highly infested variety by *T. urticae*, as it harbored throughout the whole season a mean number of 27.54, 14.09 and 41.53 individuals / leaflet for eggs, mobile & the total stages respectively. On the contrary, Paulista variety was the lowest one, its aggregated numbers showing an overall seasonal mean of 8.3, 4.04 and 12.35 individuals / leaflet respectively. While, the mean counts of pest infested Xera variety were 16.31, 5.10 and 21.41 individual / leaflet for the eggs and the motile stages respectively.

Statistical analysis of data show significant differences between tested varieties with their infestation by *T. urticae*, egg, mobile and total stages also, inspection date and interaction revealed significant differences to infestations except for interaction of eggs infestation show insignificant differences in 2007 season. According to this data, the tested varieties could be classified to three categories: highly susceptible by Bronco variety, the moderate infestation was Xera variety and the tolerates to mite infestation was Paulista variety.

#### **b) In 2008 season**

Data presented in Table (2) showed that there are differences between common bean variety infestations with the two spotted spider mite, *T. urticae*

In 2008 season, higher infestation was occurred to Paulista variety which was infested by 6.69, 5.61 and 12.31 / leaflet for eggs, mobiles and totals respectively. Bronco variety was less infested, as it harbored 5.15, 3.33 and 8.48 / leaflet for the same stages. While Xera variety was the least infested showing a seasonal mean of 4.55, 2.41 and 6.97/individuals/ leaflet for the three stages.

Statistical analysis of the obtained data revealed no significant differences between varieties and interaction in means of eggs, mobile and total number counts on leaves while indicated that the inspection date in the number of eggs, motile stage and its total with significant differences.

The obtained data on two spotted spider mite, *T. urticae* eggs, mobile and total populations throughout 2007 and 2008 seasons clearly, show that *T. urticae* was more abundant on the three tested varieties in 2007 than 2008, a significant differences between the population of *T. urticae* (eggs, motile and their total) on Paulista, Bronco and Xera cultivars, while there were no significant between Bronco and Xera cultivars during the first season. These results were in agreement to Abd El-Karim (2010) who proved that the Bronco cultivar was more susceptible to mite infestation than Paulista cultivar and the population gradually increased from mid April which was recorded 12 & 17 individuals and 33 & 76 eggs / 20 leaflets for Paulista and Bronco respectively.

Table 2. Mean count of the two-spotted spider mite, *Tetranychus urticae*, eggs, moving stages and total population / leaflet of common bean varieties at Moshtohor, Qalubia Governorate during 2008 season.

Stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Egg	Bronco	2.37	1.37	10.60	15.97	13.33	4.37	0.63	0.47	0.97	1.43	5.15	51.50
	Xera	1.33	2.77	4.53	14.20	11.90	3.67	3.03	1.27	1.93	0.90	4.55	45.53
	Paulista	5.53	4.37	16.87	20.07	12.10	1.40	0.80	1.17	1.80	2.83	6.69	66.93
	Mean	3.08	2.83	10.67	16.74	12.44	3.14	1.49	0.97	1.57	1.72	5.47	54.66

LSD 5% for:

Varieties	NS
Inspection date	3.87
Interaction	NS

Stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Mobile	Bronco	3.97	4.40	8.83	7.63	5.47	1.53	0.17	0.17	0.63	0.47	3.33	33.27
	Xera	1.00	2.97	2.37	4.17	8.30	2.37	0.70	0.17	0.87	1.23	2.41	24.13
	Paulista	4.87	8.80	6.53	19.50	14.03	0.77	0.33	0.10	0.33	0.87	5.61	56.13
	Mean	3.28	5.39	5.91	10.43	9.27	1.56	0.40	0.14	0.61	0.86	3.78	37.84

LSD 5% for:

Varieties	NS
Inspection date	3.84
Interaction	NS

Stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	6.33	5.77	19.43	23.60	18.80	5.90	0.80	0.63	1.60	1.90	8.48	84.77
	Xera	2.33	5.73	6.90	18.37	20.20	6.03	3.73	1.43	2.80	2.13	6.97	69.67
	Paulista	10.40	13.17	23.40	39.57	26.13	2.17	1.13	1.27	2.13	3.70	12.31	123.07
	Mean	6.36	8.22	16.58	27.18	21.71	4.70	1.89	1.11	2.18	2.58	9.25	92.50

LSD 5% for:

Varieties	NS
Inspection date	6.84
Interaction	NS

and reached to 592 & 865 individuals and 603 & 2054 eggs / 20 leaflets at the end of May for Paulista and Bronco respectively.

On the other hand, there were no significant differences in *T. urticae* population (eggs, motile and their total) in the second season, this may be attributed to the differences in weather conditions between the two years, or to other environmental factors.

## **2- *Tetranychus cucurbitacearum***

### **a) In 2007 season**

Table (3) show the average in relative population densities of eggs, mobile and its total numbers of the spider mite, *T. cucurbitacearum* / leaflet infested the three common bean varieties. Statistical analysis of the obtained data revealed no significant differences between varieties and interaction in means of eggs counts, also, interaction of the total numbers shown significant differences in inspection date, for the means of the eggs, motile stage and its total also, between varieties by mobile stages and its total number

The tested varieties could be arranged descendingly according to its level of infestation by *T. cucurbitacearum*, in eggs, mobile stages and total number in 2007 season as follows:

- a- Heavily infested: Bronco (1.71, 0.91 and 2.63 / leaflet for eggs, mobile stages and total number respectively).
- b- Moderately infested: Xera 1.30, 0.44 and 1.74 / leaflet.
- c- Least infested: Paulista which was infested at average of 0.79, 0.26 and 1.05 / leaflet for the same trend respectively.

It was quite evident from 2007 season that Bronco was the heaviest infested variety in contrast to Paulista variety which was the lightest infested one.

### **b) In 2008 season**

Data tabulated in Table (4) indicated no significant differences between common bean varieties in their infestation by *T. cucurbitacearum* eggs, mobile stages and total number. Also, interaction by eggs recorded non significant differences while inspection date and interaction showed significant differences by mobile stages and total number.

During this season, Paulista variety was highly infested by *T. cucurbitacearum* egg, mobile stages and total number, as it harbored throughout the whole season a mean count of 5.08, 0.76 and 5.84 / leaflet for eggs, mobile stages and total number respectively. On the contrary, Xera variety was infested with the lowest numbers

Table 3. Mean count of the two-spotted spider mite, *Tetranychus cucurbitacearum*, eggs, mobile stages and total population / leaflet of common bean varieties at Moshthohor, Qalubia Governorate during 2007 season.

Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Egg	Bronco	0.00	1.27	0.37	0.00	1.10	0.90	7.40	1.70	4.07	0.33	1.71	17.13
	Xera	1.10	0.50	0.10	0.03	0.00	0.03	4.53	3.57	2.10	1.00	1.30	12.97
	Paulista	0.07	0.00	0.10	0.00	0.00	0.03	2.43	2.07	2.43	0.73	0.79	7.87
	Mean	0.39	0.59	0.19	0.01	0.37	0.32	4.79	2.44	2.87	0.69	1.27	12.66

LSD 5% for:

Varieties	NS
Inspection date	1.31
Interaction	NS

Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Mobile	Bronco	0.83	1.67	1.30	0.90	0.53	0.73	1.47	0.57	0.87	0.27	0.91	9.13
	Xera	0.67	1.17	0.23	0.30	0.17	0.03	0.47	1.03	0.30	0.07	0.44	4.43
	Paulista	0.17	0.03	0.13	0.37	0.27	0.13	0.70	0.27	0.40	0.17	0.26	2.63
	Mean	0.56	0.96	0.56	0.52	0.32	0.30	0.88	0.62	0.52	0.17	0.54	5.40

LSD 5% for:

Varieties	0.29
Inspection date	0.36
Interaction	0.62

Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	0.83	2.93	1.67	0.90	1.63	1.63	8.87	2.27	4.93	0.60	2.63	26.27
	Xera	1.77	1.67	0.33	0.33	0.17	0.07	5.00	4.60	2.40	1.07	1.74	17.40
	Paulista	0.23	0.03	0.23	0.37	0.27	0.17	3.13	2.33	2.83	0.90	1.05	10.50
	Mean	0.94	1.54	0.74	0.53	0.69	0.62	5.67	3.07	3.39	0.86	1.81	18.06

LSD 5% for:

Varieties	1.24
Inspection date	1.56
Interaction	NS

Table 4. Mean count of the two-spotted spider mite, *Tetranychus cucurbitacearum*, eggs, mobile stages and total population / leaflet of common bean varieties at Moshtohor, Qalubia Governorate during 2008 season.

Stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Egg	Bronco	1.90	2.40	14.47	7.30	5.10	1.40	0.10	0.00	0.10	0.93	3.37	33.70
	Xera	1.27	2.97	9.93	5.50	2.77	3.87	1.33	0.17	0.13	0.00	2.79	27.93
	Paulista	3.17	5.60	21.97	15.67	3.57	0.27	0.00	0.23	0.20	0.13	5.08	50.80
	Mean	2.11	3.66	15.46	9.49	3.81	1.84	0.48	0.13	0.14	0.36	3.75	37.48

LSD 5% for:

Varieties	NS
Inspection date	3.37
Interaction	NS

Stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Mobile	Bronco	0.13	0.40	1.87	2.03	1.13	0.43	0.00	0.00	0.03	0.10	0.61	6.13
	Xera	0.20	0.63	1.03	1.00	0.67	0.23	0.20	0.00	0.07	0.03	0.41	4.07
	Paulista	0.53	0.83	3.43	1.97	0.57	0.13	0.07	0.00	0.10	0.00	0.76	7.63
	Mean	0.29	0.62	2.11	1.67	0.79	0.27	0.09	0.00	0.07	0.04	0.59	5.94

LSD 5% for:

Varieties	NS
Inspection date	0.46
Interaction	0.80

Stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	2.03	2.80	16.33	9.33	6.23	1.83	0.10	0.00	0.13	1.03	3.98	39.83
	Xera	1.47	3.60	10.97	6.50	3.43	4.10	1.53	0.17	0.20	0.03	3.20	32.00
	Paulista	3.70	6.43	25.40	17.63	4.13	0.40	0.07	0.23	0.30	0.13	5.84	58.43
	Mean	2.40	4.28	17.57	11.16	4.60	2.11	0.57	0.13	0.21	0.40	4.34	43.42

LSD 5% for:

Varieties	NS
Inspection date	3.75
Interaction	6.49



showing an overall seasonal mean of 2.79, 0.41 and 3.20 / leaflet at the same pattern respectively. While, Bronco variety was infested with seasonal mean of 3.37, 0.61 and 3.98 / leaflet to the same trend respectively. From this data, the tested varieties could be divided into three degree for the second planting season as follow: the severely infested degree was represented by Paulista variety, the second degree "moderately infested" included Bronco variety, and the third one "lightly infested degree" represented by Xera variety.

### **3 – Whitefly, *Bemisia tabaci***

#### **a) In 2007 season**

The differences between infestation levels of *B. tabaci*, eggs, nymphs, pupa and adults to the tested common bean varieties in 2007 season are shown in Table (5). A non significant difference between the tested common bean varieties was observed in all stages. But the inspection dates and interaction at the same stages revealed significant differences except for interaction of eggs infestation had shown no significant differences in the first season 2007. The mean number of eggs infestation show no significant. In the first season 2007, for varieties Bronco, Xera and Paulista which recorded 1.56, 0.81 and 0.63 eggs / leaflet respectively. While the infestation by the subsequent other stages were recorded 0.73, 0.62 & 0.17 for nymphs / leaflet and 0.14, 0.09 & 0.00 for pupae / leaflet, 0.17, 0.10 & 0.10 for adult / plant and 2.56, 1.61 & 0.91 individuals for the average total number of stages to the three tested varieties Bronco, Xera and Paulista respectively. The studied varieties may categorized to three groups, the high infestation by *B. Tabaci*, which represented by Bronco variety. The moderately infestation rate contributed with Xera variety and low infested variety, which observed in Paulista.

#### **b) In 2008 season**

Data recorded in Table (6) indicated, almost the same trend of infestation by *B. tabaci* at different stages to the three common bean varieties as that recorded in the season 2007. Bronco variety was more liable to infestation with all stages than the remaining varieties with mean seasonal counts of 3.20 eggs / leaflet, 2.12 nymphs / leaflet, 1.27 pupae / leaflet, 1.07 adults / plant and 7.67 individual for the average total stages. Also, Paulista variety was recorded the slightly infestation showing 0.79, 0.72, 0.41, 0.70 and 2.62 individuals for the previous stages respectively while Xera variety showed a seasonal mean counts of 1.77, 1.32, 0.48, 0.84 and 4.41 individuals at the four stages of whitefly, *B. tabaci* and the average total number respectively.

Table 5. Whitefly, *Bemisia tabaci*, immature stages, adults and total population on leaves of common bean varieties throughout 2007 season.

Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Egg	Bronco	1.17	0.77	1.13	0.70	1.17	0.67	3.30	4.33	0.97	1.40	1.56	15.60
	Xera	0.83	0.53	0.93	0.53	0.23	0.20	2.37	0.87	1.17	0.43	0.81	8.10
	Paulista	0.20	0.10	0.17	0.10	0.40	0.13	1.07	1.97	1.10	1.10	0.63	6.33
	Mean	0.73	0.47	0.74	0.44	0.60	0.33	2.24	2.39	1.08	0.98	1.00	10.01
LSD 5% for:		Varieties NS				Inspection date 3.87		Interaction NS					
Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Nymph	Bronco	0.00	0.27	0.20	0.07	0.20	1.17	0.40	0.57	2.20	2.23	0.73	7.30
	Xera	0.00	0.20	0.10	0.30	0.23	0.30	0.53	1.47	1.17	1.87	0.62	6.17
	Paulista	0.00	0.00	0.00	0.00	0.00	0.10	0.40	0.47	0.37	0.37	0.17	1.70
	Mean	0.00	0.16	0.10	0.12	0.14	0.52	0.44	0.83	1.24	1.49	0.51	5.06
LSD 5% for:		Varieties NS				Inspection date 0.53		Interaction 0.91					
Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Pupae	Bronco	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.03	0.00	1.27	0.14	1.37
	Xera	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.33	0.47	0.09	0.94
	Paulista	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03
	Mean	0.00	0.00	0.00	0.04	0.00	0.02	0.01	0.01	0.11	0.58	0.08	0.78
LSD 5% for:		Varieties NS				Inspection date 0.14		Interaction 0.25					
Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Adult	Bronco	0.03	0.10	0.17	0.13	0.37	0.13	0.30	0.33	0.10	0.07	0.17	1.73
	Xera	0.00	0.00	0.07	0.23	0.10	0.20	0.30	0.03	0.03	0.07	0.10	1.03
	Paulista	0.00	0.00	0.03	0.07	0.17	0.07	0.13	0.27	0.13	0.17	0.10	1.03
	Mean	0.01	0.03	0.09	0.14	0.21	0.13	0.24	0.21	0.09	0.10	0.13	1.27
LSD 5% for:		Varieties NS				Inspection date 0.12		Interaction 0.25					
Stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	1.20	1.13	1.50	0.90	1.73	1.90	3.70	5.27	3.27	4.97	2.56	25.57
	Xera	0.83	0.73	1.10	1.20	0.57	0.70	3.03	2.37	2.70	2.83	1.61	16.07
	Paulista	0.20	0.10	0.20	0.17	0.57	0.30	1.63	2.70	1.60	1.63	0.91	9.10
	Mean	0.74	0.66	0.93	0.76	0.96	0.97	2.79	3.44	2.52	3.14	1.69	16.91
LSD 5% for:		Varieties NS				Inspection date 0.94		Interaction 0.25					

Table 6. Whitefly, *Bemisia tabaci*, immature stages, adults and total population on leaves of common bean varieties throughout 2008 season.

Stage	Varieties	Inspection date in 2008										Mean	Total	
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5			
Egg	Bronco	2.03	0.67	0.03	0.47	4.47	6.57	4.70	3.33	7.10	2.67	3.20	32.03	
	Xera	1.43	0.27	0.13	0.07	4.23	2.43	2.17	3.00	2.30	1.70	1.77	17.73	
	Paulista	0.60	0.07	0.07	0.27	0.83	2.47	1.57	1.00	0.43	0.60	0.79	7.90	
	Mean	1.36	0.33	0.08	0.27	3.18	3.82	2.81	2.44	3.28	1.66	1.92	19.22	
LSD 5% for:		Varieties 0.94				Inspection date 0.91			Interaction 1.58					
Stage	Varieties	Inspection date in 2008										Mean	Total	
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5			
Nymph	Bronco	1.13	2.90	0.90	0.13	0.17	0.57	1.57	3.30	5.87	4.70	2.12	21.23	
	Xera	0.70	1.60	0.73	0.13	0.10	1.00	0.73	1.40	2.87	3.97	1.32	13.23	
	Paulista	0.67	1.30	0.87	0.13	0.23	0.23	0.90	0.80	1.33	0.70	0.72	7.17	
	Mean	0.83	1.93	0.83	0.13	0.17	0.60	1.07	1.83	3.36	3.12	1.39	13.88	
LSD 5% for:		Varieties 0.46				Inspection date 0.87			Interaction 1.51					
Stage	Varieties	Inspection date in 2008										Mean	Total	
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5			
Pupae	Bronco	0.00	0.20	0.67	0.20	0.40	0.13	0.13	2.20	5.87	2.90	1.27	12.70	
	Xera	0.00	0.10	0.13	0.33	0.03	0.17	0.10	0.60	1.20	2.13	0.48	4.80	
	Paulista	0.00	0.00	0.27	0.13	0.00	0.00	0.03	0.23	1.70	1.77	0.41	4.13	
	Mean	0.00	0.10	0.36	0.22	0.14	0.10	0.09	1.01	2.92	2.27	0.72	7.21	
LSD 5% for:		Varieties 0.65				Inspection date 0.67			Interaction 1.6					
Stage	Varieties	Inspection date in 2008										Mean	Total	
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5			
Adult	Bronco	0.10	0.07	0.03	0.43	0.47	2.07	1.73	2.13	2.50	1.20	1.07	10.73	
	Xera	0.07	0.00	0.00	0.30	0.23	1.30	1.13	2.80	1.97	0.57	0.84	8.37	
	Paulista	0.07	0.13	0.17	0.43	0.40	1.87	0.90	1.60	0.97	0.50	0.70	7.03	
	Mean	0.08	0.07	0.07	0.39	0.37	1.74	1.26	2.18	1.81	0.76	0.87	8.71	
LSD 5% for:		Varieties NS				Inspection date 0.35			Interaction 0.62					
Stage	Varieties	Inspection date in 2008										Mean	Total	
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5			
Total	Bronco	3.27	3.83	1.63	1.23	5.50	9.33	8.13	10.97	21.33	11.47	7.67	76.70	
	Xera	2.20	1.97	1.00	0.83	4.60	4.90	4.13	7.80	8.33	8.37	4.41	44.13	
	Paulista	1.33	1.50	1.37	0.97	1.47	4.57	3.40	3.63	4.43	3.57	2.62	26.23	
	Mean	2.27	2.43	1.33	1.01	3.86	6.27	5.22	7.47	11.37	7.80	4.90	49.02	
LSD 5% for:		Varieties 1.92				Inspection date 1.49			Interaction 2.57					

Throughout 2008 season, the overall mean populations of *B. tabaci* at different stages for the three varieties together were eggs (1.92 / leaflet), nymph (1.39/leaflet), pupa (0.72/leaflet), adult (0.87 / plant) and the average total stages (4.90 individual). From this data we can divided the common bean varieties into three groups as follow: the severely infested group was represented by Bronco variety, the second group (moderately infested) included Xera variety and the third one (slightly infested group) was Paulista variety.

Statistical analysis of the obtained data indicated that there are significant differences between the level of infestation with different stages of *B. tabaci* and common bean varieties, inspection date and interaction except for the adult stages which recorded non significant differences between varieties.

Results of 2007 – 2008 seasons showed that incidence of common bean infestation by *B. tabaci* as expressed as mean number of adults and immature stages increased gradually. These results are in harmony with those recorded by El-Sayed *et al.* (1991) who indicated that bean leaves showed high rate of infestation with *B. tabaci* immature stages in all plantations ( early summer, summer and winter)

Also these results are similar to the data obtained by Abd El-Karim (2010), in which the population of *B. tabaci* observed in mid April in few numbers and increased to reach its peak (46 & 104 nymphs / 20 leaflets) in the third week of May then the population sharply decreased in late May (17 & 26 nymphs / 20 leaflets) for Paulista and Bronco respectively.

Moreover, the highest mean number of *B. tabaci* infestation was occurred on Bronco cultivar. On the other hand the lowest infestation was recorded on Paulista cultivar, these results are in agreement with that obtained by Yassin (2008).

#### **4. *Thrips tabaci***

##### **a) In 2007 season**

Table (7) show the average relative population densities of *T. tabaci* "nymph, adult and total stages / leaflet" of leaves from the three common bean varieties in 2007 season. Statistical analysis of the obtained data revealed non significant differences between varieties in mean numbers of nymph, adult and the average total number of thrips per leaflet while the inspection date and interaction showed significant differences to the rate of infestation by this pest.

In 2007 season, the mean seasonal counts of *T. tabaci* found on leaves of common bean varieties Bronco, Xera and Paulista were 1.65, 1.95 and 1.62 nymphs / leaflet respectively. The order of infestation between the same varieties for adults were 0.19, 0.10 and 0.12 adults / leaflet while the populations of total stages "nymph

Table 7. Mean count of nymphs, adults and total population of *Thrips tabaci* per leaflet on three common bean varieties during 2007 season at Moshtohor, Qalubia Governorate.

stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Nymphs	Bronco	0.00	0.40	0.33	0.27	0.10	2.23	2.23	4.73	4.93	1.23	1.65	16.47
	Xera	0.03	0.40	0.30	0.50	1.17	1.33	2.97	10.90	1.33	0.60	1.95	19.53
	Paulista	0.00	0.00	0.07	0.60	1.37	3.97	6.33	2.03	1.17	0.67	1.62	16.20
	Mean	0.01	0.27	0.23	0.46	0.88	2.51	3.84	5.89	2.48	0.83	1.74	17.40

LSD 5% for:

Varieties	NS
Inspection date	1.59
Interaction	2.76

stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Adults	Bronco	0.10	0.07	0.10	0.00	0.07	0.07	1.07	0.27	0.20	0.00	0.19	1.93
	Xera	0.00	0.00	0.03	0.07	0.17	0.03	0.33	0.10	0.20	0.03	0.10	0.97
	Paulista	0.00	0.00	0.03	0.17	0.17	0.00	0.33	0.23	0.13	0.17	0.12	1.23
	Mean	0.03	0.02	0.06	0.08	0.13	0.03	0.58	0.20	0.18	0.07	0.14	1.38

LSD 5% for:

Varieties	NS
Inspection date	0.13
Interaction	0.23

stage	Varieties	Inspection date in 2007										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	0.10	0.47	0.43	0.27	0.17	2.30	3.30	5.00	5.13	1.23	1.84	18.40
	Xera	0.03	0.40	0.33	0.57	1.33	1.37	3.30	11.00	1.53	0.63	2.05	20.50
	Paulista	0.00	0.00	0.10	0.77	1.53	3.97	6.67	2.27	1.30	0.83	1.74	17.43
	Mean	0.04	0.29	0.29	0.53	1.01	2.54	4.42	6.09	2.66	0.90	1.88	18.78

LSD 5% for:

Varieties	NS
Inspection date	1.60
Interaction	2.78

Table 8. Mean count of nymphs, adults and total population of *Thrips tabaci* per leaflet on three common bean varieties during 2008 season at Moshtohor, Qalubia Governorate.

stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Nymphs	Bronco	1.27	3.57	0.97	0.97	0.40	1.97	3.80	4.70	5.27	1.00	2.39	23.90
	Xera	1.07	1.37	1.17	2.97	1.50	3.13	3.27	7.20	6.23	0.43	2.83	28.33
	Paulista	1.57	5.73	2.60	2.03	4.50	2.83	2.83	2.87	4.57	0.43	3.00	29.97
	Mean	1.30	3.56	1.58	1.99	2.13	2.64	3.30	4.92	5.36	0.62	2.74	27.40

LSD 5% for:

Varieties	NS
Inspection date	1.63
Interaction	2.82

stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Adults	Bronco	0.03	0.00	0.00	0.20	0.17	2.77	1.80	0.07	0.50	0.13	0.57	5.67
	Xera	0.20	0.00	0.17	0.13	0.10	1.53	0.93	0.17	0.07	0.00	0.33	3.30
	Paulista	0.17	0.03	0.13	0.10	0.10	0.83	0.10	0.13	0.13	0.00	0.17	1.73
	Mean	0.13	0.01	0.10	0.14	0.12	1.71	0.94	0.12	0.23	0.04	0.36	3.57

LSD 5% for:

Varieties	NS
Inspection date	0.39
Interaction	0.67

stage	Varieties	Inspection date in 2008										Mean	Total
		27/3	3/4	10/4	17/4	24/4	1/5	8/5	15/5	22/5	29/5		
Total	Bronco	1.30	3.57	0.97	1.17	0.57	4.73	5.60	4.77	5.77	1.13	2.96	29.57
	Xera	1.27	1.37	1.33	3.10	1.60	4.67	4.20	7.37	6.30	0.43	3.16	31.63
	Paulista	1.73	5.77	2.73	2.13	4.60	3.67	2.93	3.00	4.70	0.43	3.17	31.70
	Mean	1.43	3.57	1.68	2.13	2.26	4.36	4.24	5.04	5.59	0.67	3.10	30.97

LSD 5% for:

Varieties	2.49
Inspection date	1.63
Interaction	2.83

& adults together" were 1.84, 2.05 and 1.74 individuals / leaflet at the same trend. The observed data of all over mean of the common bean varieties, altogether throughout this season were 1.74 nymphs / leaflet, 0.14 adults / leaflet and 1.88 of the average total number of "nymph & adult together / leaflet.

#### **b) In 2008 season**

Data shown in Table (8) indicated the populations of *T. tabaci* nymph, adults & total stages to three different common bean cultivars throughout 2008 season. Paulista variety revealed a high mean number of *T. tabaci* nymph than the other 2 cultivars as it harbored throughout the whole season 3.00 nymphs / leaflet. On the contrary Bronco variety was infested with the lowest numbers showing a mean count of seasonal infestation of 2.39 nymphs / leaflet. Whereas the Xera variety was infested with seasonal means of 2.83 nymphs / leaflet. While the adult stage infestation of *T. tabaci*, connected by level of infestation with mean counts of 0.57 adults / leaflet for Bronco variety. While the lowest infested variety was Paulista as the mean count observed were 0.17 adults / leaflet. The order of the third variety, Xera was infested with average 0.33 adults / leaflet. The average total mean number of infestation by *T. tabaci* indicated that common bean varieties Paulista & Xera varieties infestation by *T. tabaci* with mean number of 3.17 3.16 individuals / leaflet respectively while Bronco variety harboured the lowest number of *T. tabaci*, total stages with mean count 2.96 individuals / leaflet.

The population of *T. tabaci* started at the mid of April in oscillated number and increased to reach peak in the third week of May, the result of Abd El-Karim (2010) had the same trend as our result, in which the average number of *Thrips* (nymphs) were 26.5 and 32.5 nymphs / 20 leaflets for Paulista and Bronco respectively.

Also, these results are similar to that obtained by Helal *et al.* (1996) who indicated that the mean number of *T. tabaci* appeared at May 4<sup>th</sup> increased gradually to reach its maximum level of infestation during the mid of May, then it was disappeared at the end of May.

Statistical analysis data show significant differences between infestation by *T. tabaci* and varieties, inspection date and interaction except for relationship between varieties nymph and adult stages show insignificant differences.

Infestation rate of 2.79, 0.41 and 3.20 / leaflet for the three stages respectively. While, Bronco variety was infested with seasonal mean counts of 3.37, 0.61 and 3.98 / leaflet to the same stages respectively. From this data, the tested varieties could be arranged in three degree for the second planting season as follow: the high infested degree was represented by Paulista variety, the second degree

"moderately infested" Bronco variety, and the third one "lightly infested degree" Xera variety.

On the other hand there is an insignificant difference between the population of *T. tabaci* and *Bronco*, these results are in agreement with that obtained by Yassin (2008).

## 5. (A) The Effect of Resultant Yield

### Effect of three different common bean varieties

Data recorded in Table (9) show the means of common bean yield produced by different varieties cultivated in first planting date (March, 1<sup>st</sup>) throughout 2007 and 2008 seasons. Paulista variety resulted the heaviest green pods yield, recorded 5.00 and 7.50 ton/feddan in two seasons, 2007 and 2008 respectively. Followed by Bronco variety recorded 4.00 and 6.00 ton/fed. While, Xera variety yielded the lowest weight of green pods 2.38 and 3.58 ton/fed. for the same previous seasons respectively.

Statistical analysis revealed significant effect on the resultant yield of three common bean varieties in 2007 and 2008 in their averages.

Table 9. Mean weight of green pods yield (ton/fed.) of three different common bean varieties planted in the first date (March, 1<sup>st</sup>) during 2007 & 2008 season

Weight of green pods/feddan		
Varieties	2007	2008
Bronco	4.00	6.00
Xera	2.38	3.58
Paulista	5.00	7.50
<b>L.S.D. at 5%</b>	<b>2.09</b>	<b>3.13</b>

## (B) The Effect of different stages of Pests on the Resultant Yield

### 1-Effect on three common bean varieties

#### a) In 2007 season

The results from stepwise regression for selected variables are presented in Table (10)  $X_1$ ,  $X_2$ ,  $X_3$ ,  $X_4$ ,  $X_5$  and  $X_6$  were unaccepted variables due to their insignificant contribution to variation in green pods yield. Whereas, 100% of the total variation could be attributed these removable variables in the precedent mentioned.

#### b) In 2008 season

With regard to the results of step wise regression analysis Table (11). It is clear, F value are significant for  $X_1$  and 50% of the total green pods yield/fed. variation could be related to this variable ( $X_1$ ). While 50% could be due to the other remaining variables ( $X_2$ ,  $X_3$ ,  $X_4$ ,  $X_5$  and  $X_6$ ).

The accepted  $X_1$  had the lowest CP "-1.25" and Mse "2.88". the best predication equation was :  $\hat{y} = 2.72 + 0.08$ .



Table 10. The effect of different stages of four sap sucking pests on the yield of three common bean varieties during 2007 season

Step	Variable removed	Action	Variables		Multiple		R <sup>2</sup> change	Multiple R <sup>2</sup> Adj.	Significant probability	CP	MSE	Regression equation						
			+ in/- out	Included	R	R <sup>2</sup>						b <sub>0</sub>	b <sub>x1</sub>	b <sub>x2</sub>	b <sub>x3</sub>	b <sub>x4</sub>	b <sub>x5</sub>	b <sub>x6</sub>
Zero	0		+6	6	0.81	0.66		-0.37		7.00	3.059	-6.410	-0.046	1.145	-0.981	0.453	0.487	2.565
1	4	Removed	-1	5	0.81	0.65	-0.01	-0.06	0.8403	5.05	2.093	-7.025	-0.050	1.321	-1.082		0.536	2.676
2	6	Removed	-2	4	0.65	0.42	-0.23	-0.16	0.2558	4.39	2.596	-0.172	-0.020	0.847	-0.680		0.253	
3	1	Removed	-3	3	0.60	0.35	-0.06	-0.03	0.5406	2.77	2.309	0.541		0.451	-0.601		0.222	
4	5	Removed	-4	2	0.46	0.21	-0.14	-0.05	0.3394	1.62	2.353	3.955		0.209	-0.255			
5	2	Removed	-5	1	0.34	0.12	-0.10	-0.01	0.4281	0.17	2.259	4.485			-0.137			
6	3	Removed	-6	0	0.00	0.00	-0.12	0.00	0.3700	-1.15	2.236	3.794						

Table 11. The effect of different stages of four sap sucking pests on the yield of three common bean varieties during 2008 season

Step	Variable removed	Action	Variables		Multiple		R <sup>2</sup> change	Multiple R <sup>2</sup> Adj.	Significant probability	CP	MSE	Regression equation						
			+ in/- out	Included	R	R <sup>2</sup>						b <sub>0</sub>	b <sub>x1</sub>	b <sub>x2</sub>	b <sub>x3</sub>	b <sub>x4</sub>	b <sub>x5</sub>	b <sub>x6</sub>
Zero	0		+6	6	0.855	0.731		-0.067		7.00	5.37	0.03	0.15	-0.51	-0.04	-0.19	0.09	0.76
1	3	Removed	-1	5	0.855	0.731	-0.003	0.282	0.8912	5.02	3.62	-0.28	0.16	-0.51		-0.23	0.09	0.71
2	4	Removed	-2	4	0.838	0.701	-0.029	0.403	0.5843	3.24	3.01	-1.95	0.19	-0.64		0.09	0.58	
3	2	Removed	-3	3	0.803	0.645	-0.57	0.645	0.4095	1.66	2.86	-1.10	0.10			0.07	0.36	
4	5	Removed	-4	2	0.761	0.579	-0.066	0.438	0.3629	0.16	2.83	1.37	0.09					0.29
5	6	Removed	-5	1	0.707	0.500	-0.079	0.428	0.3199	-1.25	2.88	2.72	0.08					
6	1		-6	0	0.000	0.000	-0.500	0.000	0.0295	0.50	5.03	2.71						

Variable name entered or removed in analysis

- |   |                                    |          |
|---|------------------------------------|----------|
| 1 | <i>Tetranychus urticae</i>         | "Mobile" |
| 2 | <i>Tetranychus cucurbitacearum</i> | "Mobile" |
| 3 | <i>Bemisia tabaci</i>              | "nymph"  |
| 4 | <i>Bemisia tabaci</i>              | "adult"  |
| 5 | <i>Thrips tabaci</i>               | "nymph"  |
| 6 | <i>Thrips tabaci</i>               | "adult"  |

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## تأثير الأصناف على إصابة نباتات الفاصوليا بالآفات

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تعتبر الفاصوليا من أهم المحاصيل البقولية المزروعة في مصر بالحقل المفتوح وتحت الصوب. ازدادت المساحة المنزرعة بها خلال السنتين الأخيرة خاصة في أراضي الاستصلاح الجديدة للإستهلاك المحلي والتصدير للأسواق الدولية. أجريت هذه الدراسة خلال الموسمين ٢٠٠٧ / ٢٠٠٨ في مزرعة كلية الزراعة التجريبية بمشتهر لمعرفة تأثير ثلاثة أصناف من الفاصوليا على الكثافة العددية للعنكبوت الأحمر بنوعيه الأحمر والأخضر (البيض والأطوار المتحركة) والذبابة البيضاء (البيض و الحوريات و العذراى والحشرة الكاملة) ، و التريس (حوريات وحشرات كاملة) على نباتات الفاصوليا والمحصول الناتج .

❖ كان أعلى معدل إصابة للعنكبوت الأخضر *T. urticae* من البيض على صنف البرونكو (١٦,٣٥ / بيض / وريقة) ، يتبعه صنف أكسيرا (١٠,٤٣ / بيض / وريقة) بينما كانت أقل إصابة على صنف بوليسا (٧,٥ / بيض / وريقة). من ناحية أخرى، صنف أكسيرا كان أقل معدل إصابة بالـ *T. urticae* (٣,٧٦ / طور متحرك / وريقة). رتبت أصناف الفاصوليا الثلاثة بالانخفاض طبقاً لحساسيتهم للإصابة بكل أطوار *T. urticae* كالتالي: برنكو (٢٥,٠١) < أكسيرا (١٤,٦٩) بوليسا (١٢,٣٣) إجمالي الأطوار/وريقة). هذا يشير أن أعلى معدل إصابة على أوراق برنكو وأقل معدل على صنف بوليسا.

❖ كان أعلى معدل إصابة للعنكبوت الأحمر *T. cucurbitacearum* من البيض خلال الموسمين على صنف بوليسا (٢,٩٤ / بيض / وريقة) يتبعه صنف برونكو (٢,٥٤ / بيض / وريقة) بينما صنف أكسيرا كان الأقل إصابة (٢,٠٥ / بيض / وريقة). وكان صنف برونكو أعلى مستوى إصابة بالأطوار المتحركة لـ *T. cucurbitacearum* (٠,٧٦ / طور متحرك / وريقة) يليه صنف بوليسا (٠,٥١ / طور متحرك / وريقة) بينما كان صنف أكسيرا الأقل إصابة (٠,٤٣ / طور متحرك / وريقة).

❖ ترتبط متوسطات أعداد الموسمين من الذبابة البيضاء *Bemisia tabaci* في الأطوار المختلفة بالانخفاض بحساسيتهم لإصابة أصناف الفاصوليا برونكو ، أكسيرا ، بوليسا كالتالي ٢,٣٨ ، ١,٢٩ ، ٠,٧١ ، بيض ، ١,٤٣ ، ٠,٩٧ ، ٠,٤٥ ، حوريات ٠,٧١ ، ٠,٢٩ ، ٠,٢١ / عذراى / وريقة ، ٠,٦٢ ، ٠,٤٧ ، ٠,٤٠ ، حشرة كاملة / نبات . بينما أظهر إجمالي الأطوار ٥,١٢ ، ٣,٠١ ، ١,٧٧ فرداً لأصناف الفاصوليا برونكو أكسيرا ، بوليسا تقريباً.

❖ أشيرت معدلات الإصابة بحوريات التريبس *Thrips tabaci* خلال الموسمين أن الأصناف أكسيرا وبوليستا أظهرتا ٢,٣٩ ، ٢,٣١ حورية / وريقة تقريباً لتكون أعلى إصابة بينما أظهر صنف برتكو أقل إصابة ٢,٠٢ حورية / وريقة. أدي صنف برونكو أعلى معدل إصابة بالحشرات الكاملة للتريبس ( ٠,٣٨ / وريقة) بينما كان صنف بوليستا أقل معدل إصابة ( ٠,١٥ حشرة كاملة / وريقة) صنف أكسيرا أرتبط بمعدل متوسط من الإصابة ( ٠,٢٢ حشرة كاملة / وريقة). أما متوسط أعلى تعداد موسمي للتريبس (حوريات + حشرات كاملة) كان على صنف أكسيرا ( ٢,٦١ فردا / وريقة) بينما الأصناف بوليستا وبرونكو كانا أقل أعداداً بالإصابة بكل الأطوار ( ٢,٤٦ ، ٢,٤٠ فردا / وريقة).

أظهرت النتائج أن صنف البوليستا كان أفضل الأصناف حيث كان الأقل في مستوى الإصابة وأعطى أعلى محصول من القرون الخضراء.