

**EVALUATION OF CERTAIN KIDNEY BEAN, *PHASEOLUS VULGARIS* L. VARIETIES FOR THEIR INFESTATION WITH *TETRANYCHUS CUCURBITACEARUM* (SAYED) AND *BEMISIA TABACI* (GENN.) UNDER FIELD CONDITIONS OF KAFR EL-SHEIHK**

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(Manuscript received 9 January 2011)

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**Abstract**

Field experiments were carried out at Sakha Agric. Res. Station Farm, Kafr El-Sheikh to evaluate certain kidney bean varieties (Pronco, French bean and Polesta) and two breeding lines (FI hybrid and R1655) of bean, *Phaseolus vulgaris* L for their relative susceptibility to the spider mite, *Tetranychus cucurbitacearum* (Sayed) and the white fly, *Bemisia tabaci* (Genn.) on three varieties. during two successive seasons, 2008 and 2009 .

Obtained data showed that *T. cucurbitacearum* recorded the highest numbers during the third week of July in the first season , while *B. tabaci* appeared its maximum in the fourth week of June. Meanwhile, in the second season the two pests recorded the highest number in the fourth week of July. The numbers of *T. cucurbitacearum* were higher than *B. tabaci* during the two study seasons. The population density of *T. cucurbitacearum* was higher in the first season than in the second one, while *B. tabaci* showed the reverse.

Based on the mean number of the two study seasons, variety Polesta harbored significantly the highest population of *T. cucurbitacearum* followed by French bean and the breeding line FI hybrid ,while R1655 was the lowest infested. The highest infestation with *B. tabaci* occurred on French bean while, Pronco and R1655 were the least infested.

Regarding to the susceptibility degree to the two pests, varieties Polesta, French bean and breeding line FI hybrid appeared susceptible. The variety Pronco appeared as low resistant and breeding line R1655 appeared as moderate resistant.

Thus, the gained results should be taken into account in planning programs of integrated pest management in the bean fields.

**INTRODUCTION**

The kidney bean, *Phaseolus vulgaris* L. is one of the most important vegetables in many parts of the world as it contains a complete protein compared with the other vegetables. In Egypt, this crop has been subjected to attack by several pests, among which are the spider mite, *Tetranychus*

*cucurbitacearum* (Sayed) and the white fly, *Bemisia tabaci* (Genn.). These pests caused severe damage to the plants by feeding on the plant sap in addition to plant viruses transmission (Helaly *et. al.*, 1983, Wahba *et. al.*, 1986, Metwally, 1989, Metwally and Mahgoub, 1991 and Pena Rojas *et. al.*, 1992).

In general, the chemical control of these pests creates several problems i.e., environmental pollution, destruction of beneficial insects and pest resistance to many pesticides (John *et. al.*, 1986). Therefore, it is necessary to select the tolerant or resistant varieties as one of the simplest and useful tactics in the integrated pest management programs (Dent, 1991). However, plant resistance to insects is generally derived from certain biochemical and /or the metabolism of insects influencing the relative degrees of damage caused by these insects (Metcalf and Luckmann, 1975).

So, the present work was carried out to study the population fluctuation of the spider mite, *T. cucurbitacearum* and the white fly, *B. tabaci* on three varieties and two breeding lines of bean during two successive seasons, 2008 and 2009 at Kafr El-Sheikh governorate.

## **MATERIALS AND METHODS**

Field experiments were carried out at Sakha Agric. Res. Station Farm, Kafr El-Sheikh Governorate during the two successive bean growing seasons, 2008 and 2009. Three bean varieties (Pronco, French bean and Polesta) and two breeding lines ( F1 hybrid and R1655 ) were supplied by National Legumes Research Program at Sakha Agric. Res. Station. For each season, the experimental area was divided into 20 plots, each of 42 m<sup>2</sup>. The tested varieties and the breeding lines were sown in the first week of May and June during the first and second season, respectively in a complete randomized block design with four replicates for each. The normal agricultural practices were followed without any pesticidal treatments throughout the growing season. Weekly sample of 10 bean leaves was collected at random from each plot when plants were one month old and continued till the end of the growing season. The collected leaves were kept in paper bags and transferred to the laboratory to count the motile stages of spider mite and the immature stages of white fly by the aid of stereomicroscope.

Classification of the susceptibility degree of each bean cultivar was determined according to the general mean of number ( $\bar{x}$ ) of each pest and the standard deviation (SD) as reported by Chiang and Talekar (1980). The variety or the breeding line that had mean number of the pest more than  $\bar{x} + 2SD$  was considered

highly susceptible (HS), between X and X+2SD, susceptible (S), between X and 1-1SD, low resistant (LR), between X- 1SD and X-2SD moderately resistant (MR) and less than X-2SD was considered highly resistant (HR).

The obtained data were statistically analyzed using F- test and the mean numbers of the two pests were compared according to Duncans multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

### 1- Population fluctuation of *Tetranychus cucurbitacearum* (Sayed) and *Bemisia tabaci* (Genn.) on certain bean varieties and breeding lines during 2008 and 2009 growing seasons

Data presented in table (1) exhibit the numbers of the spider mite, *T. cucurbitacearum* (motile stages) and the white fly, *B. tabaci* (nymphs) on three bean varieties (Pronco, French bean and Polesta) and two breeding lines (F1 hybrid and R1655) during the growing season of 2008. With regard to the spider mite, the population began to appear with few numbers in the first week of June nearly on all the tested varieties and the breeding lines. Afterwards, the numbers increased sharply recording its maximum in the third week of July with means of 393.0, 770.3, 443.3, 279.5, 389.3 individuals / 10 leaves for Pronco, French bean, Polesta, R1655 and F1 hybrid, respectively ( at 26.9C<sup>0</sup> and 66.5% RH) . The level infestation of whitefly, the insect started in very few numbers in the second week of June on the tested varieties and the breeding lines. Then, the population increased gradually till reaching its peak in the fourth week of June by 9.8, 15.8, 12.3, 7.3 and 19.5 nymphs / 10 leaves on Pronco, French bean, Polesta ,R1655 and F1 hybrid, respectively (at 25.0 C<sup>o</sup> and 67.2 % RH) and decreased gradually till the end of the season.

During 2009 season, table (2) revealed that the spider mite appeared with a low number in the first week of July for the tested varieties and the breeding lines, while the first infestation with *B. tabaci* started one week later. After that, the population of the two pests increased recording its maximum in the fourth week of July at 26.3C<sup>0</sup> and 75.2 %RH. The population then declined gradually till the end of the season.

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Table 1. Mean number of *Tetranychus cucurbitacearum* (Sayed) and *Bemisia tabaci* (Genn.)/10 leaves of three bean varieties and two breeding lines during 2008 season.

Sampling date		<i>T. cucurbitacearum</i>					<i>B. tabaci</i>					Weather factors	
Month	week	1	2	3	4	5	1	2	3	4	5	Temp.	RH%
June	1 <sup>st</sup>	0.0	3.0	5.8	6.3	9.3	0.0	0.0	0.0	0.0	0.0	23.8	63.8
	2 <sup>nd</sup>	11.3	21.5	14.3	10.3	22.0	1.5	7.5	0.0	0.8	3.8	24.6	62.6
	3 <sup>rd</sup>	30.5	62.8	49.3	25.0	60.0	7.0	6.5	1.5	6.5	15.3	24.6	66.9
	4 <sup>th</sup>	149.3	70.5	120.3	44.0	133.0	9.8	15.8	12.3	7.3	19.5	25.0	67.2
July	1 <sup>st</sup>	138.0	95.5	135.8	60.0	103.0	1.5	9.8	2.0	5.8	4.0	26.7	70.1
	2 <sup>nd</sup>	387.0	210.3	341.5	153.5	273.0	0.5	8.3	1.3	1.3	2.0	27.0	71.9
	3 <sup>rd</sup>	393.0	770.3	443.3	279.5	389.3	1.5	1.8	0.5	1.5	1.0	26.9	66.5
	4 <sup>th</sup>	166.3	646.5	117.0	265.8	248.5	0.3	3.0	0.0	1.8	0.0	25.9	70.0
General mean		159.43	241.05	153.41	105.55	154.76	2.76	6.59	2.20	3.13	5.70	25.49	67.38

1 = Pronco 2 = French bean 3 = Polesta 4 = R1655 5 = FI hybrid

**2- The relative susceptibility of certain bean varieties and breeding lines to *Tetranychus cucurbitacearum* (Sayed) and *Bemisia tabaci* (Genn.)**

Table (3) showed the mean number and the relative susceptibility of three bean varieties and two breeding lines to the spider mite and the white fly during the growing seasons, 2008 and 2009. It was cleared that, the mite individuals was higher than *B. tabaci* during the two study seasons. Also, the population of *T. cucurbitacearum* was higher on the tested varieties and the breeding lines in the first season than in the second one, while the reverse was obtained for the white fly. This may be due to the effect of climatic factors and / or the abundance of the natural enemies as mentioned by Kumar(1984) who reported that certain environmental conditions influence fundamental physiological processes of the plant as well as the pest. Thus, a variety that exhibits resistance in one locality or environment may be susceptible in another. Also, Metcalf and Luckmann (1975) reported that certain environmental conditions may alter the physiology of the plant to the extent that it becomes unsuitable as a host for a certain pest.

Table 2. Mean number of *Tetranychus cucurbitacearum* (Sayed) and *Bemisia tabaci* (Genn.) / 10 leaves of three bean varieties and two breeding lines during 2009 season.

Sampling date		<i>T. cucurbitacearum</i>					<i>B. tabaci</i>					Weather factors	
Month	week	1	2	3	4	5	1	2	3	4	5	Temp.	RH%
July	1 <sup>st</sup>	25.8	1.8	9.0	18.5	11.0	0.0	0.0	0.0	0.0	0.0	25.2	72.2
	2 <sup>nd</sup>	48.8	7.5	21.5	37.8	23.0	0.3	2.0	0.3	2.3	1.3	25.4	71.8
	3 <sup>rd</sup>	150.0	111.8	431.0	68.3	199.5	13.3	30.0	12.5	6.0	30.8	27.0	71.5
	4 <sup>th</sup>	150.8	154.5	670.0	79.5	478.0	28.5	43.0	60.0	26.0	31.5	26.3	75.2
Aug.	1 <sup>st</sup>	24.0	23.8	102.0	19.8	54.0	10.8	26.8	15.5	7.8	16.8	27.3	74.8
	2 <sup>nd</sup>	9.8	8.0	19.3	5.3	10.8	8.0	13.5	12.5	5.8	9.3	27.4	73.8
	3 <sup>rd</sup>	3.8	4.0	7.5	2.0	4.5	5.0	6.3	8.8	8.0	10.8	24.5	72.9
General mean		58.96	44.46	180.04	33.00	111.54	9.39	17.36	15.64	7.96	14.32	26.16	73.17

1 = Pronco    2 = French bean    3 = Polesta    4 = R1655    5 = FI hybrid

Based on the mean number of the two study seasons, the results revealed that variety Polesta harbored significantly the highest number of the spider mite (166.73 individuals/10 leaves), while breeding line R1655 received the least number (59.29 individuals/10 leaves). The rest cultivars showed variable levels of infestation. As for the white fly, French bean received significantly the highest number (11.98 insects/ 10 leaves) followed by FI hybrid and Polesta with mean of 10.01 and 8.92 insects, respectively, while Pronco and R1655 harbored the lowest number (6.08 and 5.55 insects).

However, plant resistance to insects is generally derived from certain biochemical and /or the metabolism of insects influencing the relative degrees of damage caused by these insects ( Metcalf and Luckmann, 1975).

In respect to the susceptibility degree (SD) to the two pests, results in table (3) revealed that , the variety Polesta , French bean and breeding line FI hybrid appeared susceptible (S), as they exhibited the highest numbers of the two pests. The variety Pronco appeared as low resistant (LR), while the breeding line R1655 appeared as moderate resistant (MR). However, it is an important to point out herein that the pest mean numbers must refer to and / or agree with the resistance degree of variety or line (Hybrid).

Table 3. Mean number and susceptibility degrees(SD) of certain bean varieties and breeding lines to *Tetranychus cucurbitacearum* (Sayed) and *Bemisia tabaci* (Genn) during the two successive seasons of 2008 and 2009.

Variety or breeding line	<i>T. cucurbitacearum</i>				<i>B. tabaci</i>			
	2008	2009	Mean $\pm$ SD*	SD	2008	2009	Mean $\pm$ SD*	SD
Pronco	159.43b	58.69c	109.06 $\pm$ 71.0d	LR	2.76bc	9.39c	6.08 $\pm$ 4.7c	LR
Frensh bean	241.05a	44.46d	142.77 $\pm$ 137.4b	S	6.59a	17.36a	11.98 $\pm$ 7.6a	S
Polesta	153.41b	180.04a	166.73 $\pm$ 18.8a	S	2.20c	15.64ab	8.92 $\pm$ 9.5b	S
Fl hybrid	154.76b	111.54b	133.15 $\pm$ 30.6c	S	5.70a	14.32b	10.01 $\pm$ 6.1	S
RI655	105.55c	33.00e	69.28 $\pm$ 51.3e	MR	3.13b	7.96c	5.55 $\pm$ 3.4e	MR
F-value	200.61	309.28	160.88		33.56	23.93	30.14	

SD\* = standard deviation

For each column, means followed by the same letter are not significantly different at 5% level of probability by Duncan Multiple Range Test (1955).

From the foregoing results, it could be concluded that the population of the spider mite was more abundant than whitefly during the two seasons. Also, French bean, Bolesta and Fl hybrid appeared susceptible to the two pests, while pronco and R1655 appeared low infested and moderate resistant, respectively.

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## تقييم بعض أصناف و سلالات الفاصوليا للإصابة بالعنكبوت الأحمر العادي والذبابة البيضاء تحت الظروف الحقلية لكفر الشيخ

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تم إجراء تجارب حقلية بمزرعة محطة البحوث الزراعية بسخا - كفر الشيخ لدراسة الكثافة العددية للعنكبوت الأحمر العادي ( *Tetranychus cucurbitacearum* ) والذبابة البيضاء *Bemisia tabaci* علي ثلاثة أصناف Polesta ,Pronco. French bean وسلالتين FI hybrid R1655 ,للفاصوليا خلال موسمي 2008 ، 2009 م.

أوضحت النتائج أن أعلى تعداد للعنكبوت الأحمر كان في الأسبوع الثالث من شهر يوليو في الموسم الأول بينما كان أعلى تعداد للذبابة البيضاء في الأسبوع الرابع من يونيو . أما في الموسم الثاني فان كل من الاثنتين سجل أعلى تعداد في الأسبوع الرابع من شهر يونيو . كما أوضحت النتائج أن تعداد العنكبوت الأحمر العادي كان أعلى من الذبابة البيضاء خلال موسمي الدراسة . كانت الكثافة العددية للعنكبوت الأحمر العادي أعلى في الموسم الأول عن الموسم الثاني بينما وجد العكس بالنسبة للذبابة البيضاء .

وبناء علي متوسط التعداد في الموسمين وجد أن صنف Polesta سجل معنويا أعلى تعداد للعنكبوت الأحمر العادي يليه صنف French bean والسلالة FI hybrid بينما كانت السلالة R1655 أقلهم إصابة - كما وجد أن أعلى إصابة بالذبابة البيضاء كانت علي الصنف French bean بينما كان الصنف Polesta و السلالة R1655 أقلهم إصابة .

كما وجد من الدراسة أن درجة الحساسية للأصناف و السلالات المختبرة لكل من الأفتين أن الصنف Polesta ، French bean والسلالة FI hybrid كانت حساسة للإصابة بهاتين الأفتين بينما أظهر الصنف Pronco درجة مقاومة اقل للإصابة بالأفتين في حين أظهرت السلالة R1655 درجة مقاومة متوسطة .

وهكذا فان هذه النتائج يجب أن تؤخذ في الاعتبار عند تصميم برامج الإدارة المتكاملة للآفات في حقول الفاصوليا .