

EFFECT OF *Faba bean* VARIETIES AND PHOSPHORUS FERTILIZATION ON THE POPULATION DENSITY APHIDS AND THRIPS IN QALUBIA GOVERNORATE.

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ABSTRACT

Experiments were conducted during the three seasons of 2010/11 and 2011/12 and 2012/13 at the Experimental Research Station in Moshtohor, Faculty of Agric. ,Benha Univ. ,Qalubia Governorate, Egypt. Three phosphorus fertilization levels (0, 100, and 200kg/fed) were applied to clarify their effects on the population density of *aphid spp* and thrips (*Thrips tabaci*). in Faba bean fields, its relationship with chemical components on leaf and susceptibility of the two varieties (Giza843 and sakha2). The obtained results showed that the highest population densities of these pests occurred at no phosphorus fertilization (control) followed by 100 kg/fed. The lowest population densities were recorded for the treatment at 200 kg/fed. On the other hand, sakha2 var. received the lowest infestation. Significant differences between the means of chemical components in leaves of Faba bean plants were obtained.

INTRODUCTION

Faba bean (*Vicia faba L*) is one of the most important economic crops grown in Egypt. Seeds of broad bean has highly protein content, are used either as fresh green vegetable or dried for human and animal feeding Duke (1981). Faba bean plants is liable to attack by several insect pests, from the early stage of growth through the late development to the post harvest stage. The most important insect pests in the field are aphid species, thrips and leaf miners. Certain aphid species are common as major pests of economic plants. For instance, the cowpea aphid, *Aphis craccivora*, (Homoptera :Aphidiade) is a polyphagous pest species of field crops especially leguminosae. It damages the plants by sucking the sap. It also considered a vector of about 30 plants virus diseases. (Blackman and Eastop 1984; Saenz *et al* 2001; Tawfeek, 2004, El Hawary and Abd El- Salam 2005). Legumes are inhabited by a number of pests, including thrips (Thysanoptera). Thrips damage crops by feeding directly on leaves, flowers and/or fruits (Lewis 1975, 1997). They are difficult to control because of their small size, high reproduction rates and rapid development of resistance to many insecticides (Shelton *et al*. 2003).

Phosphorus is very important nutrient for crop growth and high yield with good quality. It plays a key role in metabolic process such as the conversion of sugar into starch and cellulose. As a result, phosphorus deficiency causes stunting, delayed maturity and shriveled seeds (Soheir Mokhtar 2001 and Abdalla (2002): El Douby *et al* .(2002).

The objective of this study was evaluating the effect of *Vicia faba* varieties and phosphorus fertilization on the infestation with aphids and thrips and their effects on the resultant yield.

MATERIALS AND METHODS

Field study:

Field experiment were carried out in the Experimental Research Station at Moshtohor, Faculty of Agric ,Benha Unv ,Qalubia Governorate during three successive agriculture seasons 2010/11,2011/12,2012/13 were seeded on November 17th. Using the varieties Giza843 and Sakha2 of broad bean ,*Vicia faba* L.,fam ,Leguminosae. Every tested variety was replicated three times (3 lines for each replicate of 3M length) .

1- Effect of phosphorus fertilizer on the population density aphid and thrips.

This experiment was conducted to determine the effect of three levels of phosphorus fertilizer (0.0 , 100 , and 200 kg/fed of P_2O_5) on the population aphid and thrips infestation. Seeds of two varieties were sown in 17 November .at the three investigated seasons. An area of about 190m² was divided into 12 plots (three replicates for each treatment) (all plots were arranged in a complete randomized block design.

Thirty leaves randomly were sampled from each treatment, weekly. Every sample was put in a paper bag, labeled, tied and transferred to the laboratory for examining and counting aphids and thrips, using the aid of a stereomicroscope.

2-laboratory studies:

Analysis of photochemical components of leaves of the tested Faba bean varieties.

leaf samples were collected during the fruiting stage ,leaves of each sample were cleaned and washed with distilled water ,then quickly dried by placing gently between filter papers to remove the excess of water ,leaves were placed in a drying oven at 60c°for only one day .The dried leaves were crashed to fine powder and stored in glass bottles to determine carbohydrates and total protein contents according to the methods of Pregl(1945) and Michel *et al.* (1956).The percentages of reduced ,non-reduced and total sugars were also estimated in the dry powder using the method of Forses(1938).Also the phosphorous and potassium content were determined according to method of Troug and Meyer (1939). The conventional cultural practices were applied and no chemical pesticides used during the present study.

3-Statistical analysis

Statistical analysis for ANOVA was carried out by using SAS 9.3.1 Portable.

Whereas the means were compared through LSD tests, least significant differences at P=0.05 level.

RESULTS AND DISCUSSION

1- Effect of phosphorus fertilizer on the population density of Faba bean plants by aphid and thrips.

The effect of three levels of phosphorus fertilization (0, 100 and 200kg/feddan) on the population density of aphids and thrips infesting Faba bean plants were studied during the three successive seasons of 2010/11,2011/12and 2012/13 .

a- Aphid (*Aphis craccivora w.*)

Data in Table (1) showed that there are obvious differences between the insect population in the three seasons. The plants in the first season 2010/2011 harbored higher population of aphids than the two other seasons . Results also showed that the addition of phosphorus fertilizer minimize the aphid population .The level of 200 kg/fed recorded the lowest population of aphid lasted to 23.57,6.63 and 3.69 indivi /10leaves during 2010/11,2011/12 and 2012/13 Faba bean seasons, followed by the level of 100 kg /fed recorded 28.8,8.6 and 5.2 indivi /10 leaves ,respectively .The high number of aphid population recorded on the plants which don't receive any phosphorus fertilization(35.81,13.6 and 9.18 individuals /10 leaves for the treatment of 0,0 kg /fed of P_2O_5 ,respectively .This trend was found and recorded in the three season of cultivation with significant differences.

In accordance with such results ,El- Hosary(2001)mentioned that the average number of aphids in both seasons significantly decreased by increasing P-levels up to 60 kg/fed.

b- Thrips(*Thrips tabaci L.*):

Obtained results in tables (2)demonstrate that the lowest mean of thrips counts were recorded on *Faba bean* plants received 200 units of p_2o_5 / fed , lasted to 9.5 ,5.37 and 3.01indivi /10 leaves , in 2010/11,2011/12 and 2012/13 Faba bean tested seasons ,respectively. Followed by using 100kg/fed,12.6, 7.1 and4.7indiv /10 leaves, in 2010/11, 2011/12 and 2012/13 Faba bean seasons .respectively. While the highest population densities of thrips were 14.96,10.13 and 6.31 indivi /10 leaves , in 2010/11,2011/12 and 2012/13 Faba bean seasons, respectively, occurred with 0.0 fertilizer (control) 2010/11,2011/12 and 2012/13Faba bean seasons ,respectively.

Similar results were obtained by ,Asiwe,J.A. N.(2009)who mentioned that damage by *A. craccivora*, *M. sjostedti* and *M. vitrata* were significantly ($P < 0.05$)lower at 30 and 45 kg P_2O_5 ha⁻¹ and consequently higher grain yields were obtained.

Table 1 :Effect of phosphorus fertilization on the total number and mean of aphids *A. craccivora* Faba bean during three successive seasons at Qalubia Governorate .

Levels of P ₂ O ₅ /fed	Seasons					
	2010/11		2011/12		2012/13	
	Total	Mean	Total	Mean	Total	Mean
0.0	429.67	35.81a	231.167	13.59a	128.50	9.18a
100	345.50	28.79bb	146.17	8.59b	73.167	5.23b
200	282.83	23.57b	112.67	6.627c	54.67	3.6905c
LSD at 5%		6.3873		1.7769		1.1961

LSD=Least Significant Difference

Table 2 : Effect of phosphorus fertilization on the total number and mean of thrips (*Thrips tabaci*) Faba bean during three successive seasons at Qalubia Governorate.

Levels of P ₂ O ₅ /fed	Seasons					
	2010/11		2011/12		2012/13	
	Total	Mean	Total	Mean	Total	Mean
0.0	179.49	14.96a	172.33	10.14a	88.33	6.31a
100	150.99	12.58b	120.49	7.09b	66.17	4.73b
200	114	9.50c	91.33	5.37c	42.17	3.01c
LSD at 5%		1.965		1.4916		0.8339

2- Effect of Faba bean varieties on population density of aphids *A. craccivora* and Thrips(*Thrips tabaci* L.):

The obtained results indicated that there were a significant differences (P >0.05) between the mean numbers of aphids among the two tested varieties .During second and third seasons 2011/12 &2012/13 table (3), but there are insignificant differences between the two varieties in the first season 2010/2011.The highest mean number of aphids was recorded on Giza 843var, being 31,11.4 and 6.9 indivi/10 leaves during the three successive seasons, respectively. The lowest infestation was observed on Sakha2, lasting to27.8,7.8 and 6.9indivi/10 leaves during the three tested successive seasons, respectively.

Table 3: Effect of two varieties on the total number and mean of Faba bean during three successive seasons at Qalubia Governorate.

Varieties	Seasons					
	2010/11		2011/12		2012/13	
	Total	Mean	Total	Mean	Total	Mean
Sakha2	403.25	27.76a	133.12	7.83b	71.33	5.09b
Giza 843	360.87	31.019a	193.55	11.38a	97.56	6.97a
LSD at 5%		5.2152		1.4509		.9766

Table 4: Effect of two varieties of on the total number and mean of thrips (*Thrips tabaci*) Faba bean during three successive seasons at Qalubia Governorate

Varieties	Seasons					
	2010/11		2011/12		2012/13	
	Total	Mean	Total	Mean	Total	Mean
Sakha2	146.731	11.2870 b	113.339	6.6667b	59.66	4.2619b
Giza 843	174.2962	13.4074a	142.779	8.3987a	71.448	5.1032a
LSD at 5%		1.6051		1.2179		0.6809

B-Thrips(*Thrips tabaci*)

The obtained results indicated that there were significant differences (P >0.05) between the mean numbers of thrips among the tested varieties, during the three successive seasons (2010/11, 2011/12 and 2012/13) table (4), then, the highest mean number of thrips infestation was recorded on Giza 843var, being 13.4,8.4 and 5.1indivi/10 leaves during three successive seasons, respectively. The lowest infestation was observed on Sakha2var, being 11.29,6.67 and 4.26indiv /10 leaves e during three successive seasons, respectively.

From the previous results, it could be concluded that the two tested Faba bean varieties were variably infested with aphids, and thrips, during three successive seasons2010/11,2011/12 and 2012/13with significant differences.

Similar results were obtained by,Ebadahet *al.*(2006)Described the susceptibility of six Faba bean varieties (Giza 714, G716, G843, G429, G643and G461) to infestation with legume aphids, *Aphis craccivora*(Koch),Results show that the six tested varieties showed different susceptibility to the three insect pests.

3- Chemical analysis of *Faba bean* leaves induced by different levels of phosphorus fertilizers and infestation of aphid and thrips in 2011/12 season.

Data recorded in Table (5) , show a significant differences between the means of chemical components in the leaves of *Faba bean* plants treated with different levels of phosphorus fertilizer during 2011/12 season. The

lowest abundance of thrips and aphids occurred on leaves of *Faba bean* plants (6.6275 and 5.3725 indivi/10 leaves, treated with 200kg/fed of p_2o_5 associated with higher levels of protein, (14.91 mg/gm dry weight), T. Carbohydrate(12.94mg/gm dry weight), Total sugars(8.758 mg/gm dry weight), Non-reduce sugars(4.85 mg/gm dry weight), phosphor(0.75 mg/gm dry weight), and potassium(32.44 mg/gm dry weight) respectively, in addition there no significant difference between treatments in reduce sugars Ghallabet.al/(2014) indicated that the population abundance of *B. tabaci*, adults on bean plants during high infestation showed significantly relation with total protein and total sugar. While, negative correlation value was calculated in case of phosphorus fertilizers.

Table (5):Chemical analysis of *Faba bean* leaves induced by different levels of phosphorus fertilizers during 2011/12 season.

Level of p_2o_5	Total. Carbohydrate	T. sugars	reduce sugars	Non-reduce Sugars	Phosphor	Potassium
0.0	12.56c	8.24c	3.90aa	3.85c	0.75c	31.13ab
100	12.768b	8.468b	3.80aa	4.51b	0.70b	28.98bb
200	12.94a	8.758a	3.88aa	4.85a	0.75a	32.44aa
L S D	0.0968	0.1242	0.2131	0.3684	0.0265	2.1524

4-Yield:

Effect of the treatment with phosphorus fertilizer on the field of Faba bean.

Data presented in tables (6) show that the yield of *Faba bean* plants treated with the different tested treatments of three levels of phosphorus fertilizer was highly significant in three season .The largest weight of dray seeds yield during 2010/11,2011/12 and 2012/13seasons recorded 1199.3,1166.7 and1143.3kg/fed ,respectively ,while the lowest weight of dray seeds yield were 616,816.7 and 812kg/fed, respectively occurred with 0.0 fertilizer (control) during 2010/2011,2011/2012 and 2012/2013 Faba bean seasons ,respectively .Followed with by using 100kg/fed,984.7, 1082.7and 1082.7k g/ fed, in2010/11, 2011/12 and 2012/13 Faba bean seasons ,respectively.

This result agree with Getachew and Angaw (2006)who Studied the effect of phosphorus fertilizer on the yield and yield components of Faba bean. Five levels of phosphorus fertilizer were used. Results indicated a positive linear response of Faba bean seed yield to phosphorus fertilizer applications. Plant height, number of pods per plant, nodulation score and plant biomass of Faba bean were positively ,agree with Hashem abadi (2013).

Effect of two *Faba bean* varieties on the yield.

Data recorded in Tables (4,5&6) , show the means of Faba bean yield produced by two varieties during 2010/11,2011/12 and 2012/13 season .The highest total grain yield was obtained by Sakha2 cultivar , recorded 1124, 1115.3and1054.7kg/fed during 2010/11,2011/12 and 2012/13 Faba bean seasons ,respectively .Followed by Giza843 cultivar recorded 877.3,942

and 971.7 kg/fed during 2010/11, 2011/12 and 2012/13 Faba bean seasons, respectively.

Means of harvested Faba bean grain yield per fedan proved that there is a significant difference between Sakha2 cultivar and Giza 843 ($P < 0.05$), L.S.D = 40.28, 29.9 and 29.17 through the three seasons.

Table (6) : Effect of the treatment with phosphorus fertilizer on the field of Faba bean during three seasons 2010/2011, 2011/2012 and 2012/2013.

Level of P_2O_5	2010/11 Season		2011/12 Season		2012/13 Season	
	Yield	Wight of 100 seeds	Yield	Wight of 100 seeds	Yield	Wight of 100 seeds
0.0	616	82.83	816.6	85.33	812	80.00
100	984.7	86.17	1082.7	84.58	1082.7	80.00
200	1199.3	86.17	1166.7	80.50	1143.3	85.00
L S D	49.328	5.5059	36.662	5.9543	35.722	11.701

Table (7) : - Effect of two Faba bean varieties on the resultant yield during three seasons 2010/2011, 2011/2012 and 2012/2013.

Varieties	2010/2011 Season		2011/2012 Season		2012/2013 Season	
	Yield	Wight of 100 seeds	Yield	Yield	Wight of 100 seeds	Yield
Sakha2	1124a	94.67a	1153.3a	1124a	94.67a	1153.3a
Giza 843	877.3b	76.89b	924b	877.3b	76.89b	924b
LSD at 5%	40.276	4.4955	29.934	40.276	4.4955	29.934

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تأثير أصناف الفول والتسميد الفوسفاتي علي كثافة التعداد بحشرات المن والتربس في محافظة القليوبية

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أجريت الدراسة الحقلية خلال ٣ مواسم ١١/٢٠١٠، ١٢/٢٠١١ و ١٣/٢٠١٢ في محطة تجارب بحوث كلية الزراعة بمشتهر، جامعة بنها، محافظة القليوبية. تم استخدام ٣ مستويات من التسميد الفوسفاتي كالأتي صفرو ١٠٠ و ٢٠٠ كجم فوسفور/فدان لدراسة تأثيرها على الكثافة العددية للمن والتربس في حقول الفول، كما وردت علاقة التركيب الكيميائي للورقة وحساسية صنفين من الفول (سحا ٢ وجيزة ٨٤٣) بالإصابة بالمن والتربس. أظهرت النتائج المتحصل عليها أن أعلى تعداد للمن والتربس سجل على النباتات التللم تعامل ٠.٠ كجم فو/فدان تلتها النباتات التي تم تسميدها بمعدل ١٠٠ كجم فو/فدان. بينما كان أقل تعداد للمن والتربس على النباتات التي تلقت تسميد بمعدل ٢٠٠ كجم فو/فدان. في حين تلقى الصنف سحا ٢ أقل تعداد من المن والتربس، كما وجدت علاقة معنوية بين التركيب الكيميائي للورق والتسميد الفوسفاتي والإصابة. وكان الصنف سحا ٢ أقل جذبا لتعداد المن والتربس من الصنف جيزة ٨٤٣ وكان هناك علاقة معنوية بين تركيب الورقة ومحتواها الكيماوى والتسميد الفوسفاتي وبالتالي الإصابة بالحشرات، وأظهرت النتائج علاقة معنوية موجبة بين زيادة التسميد الفوسفاتي والمحصول الناتج من النباتات المعامله وكذلك كان المحصول للصنف سحا ٢ أكثر من الصنف جيزة ٨٤٣.