

## Effect of Eight Cultivars of Faba Bean, *Vicia faba* L., on the Black Bean Aphid, *Aphis fabae* Scopoli (Homoptera: Aphididae), in the Field

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### ABSTRACT

Eight cultivars of the faba bean, *Vicia faba* L., were chosen for field trials to study their effect on populations of the black bean aphid, *Aphis fabae* Scopoli (Homoptera: Aphididae) in Al-Jubeiha in Jordan. The tested cultivars were; B.L.L. 2004, B.S.2004, B.M.2004, Jordan 2004, I.L.B. 1814, Giza 4/2000, I.L.B. 1266 and Giza429/04. The studied parameters were: number of aphid colonies, number of infested plants, percentage of infested plants and number of aphids. The cultivar B.L.L.2004 sustained high population levels of *A. fabae*, whereas, lower population levels were noted in cultivar Giza4/2000. The other tested cultivars proved to sustain somewhat lower populations.

**Keywords:** Faba bean, Resistance, *Aphis fabae*, Jordan.

### 1. INTRODUCTION

The faba bean (FBA), *Vicia faba* L., is a cold hardy, grain legume originally domesticated in the Hindustani region of central Asia, but now cultivated from tropic to sub-arctic climates (Zeven and Zhukovsky, 1975). This taxa has been artificially divided by seed size into three subspecies (Polhill and van der Maesen, 1985). The broad bean (*V. faba* var. *major* Harz) is mostly grown as a grain vegetable because of its large seed size, while the horse bean (*V. faba* var. *equina* Pers.) and the pigeon or tick bean (*V. faba* var. *minor* Beck) are grown primarily for animal feed or as a green manure crop. In Europe, these two later species are referred to as “field beans” (Bond *et al.*, 1985). The faba bean is one of a few freeze tolerant winter legumes that could be integrated into Jordan agriculture as a vegetable crop. However, the planted area with faba bean in the Jordan valley and highlands in (2005) was (1550.5 ha) and produced (17153 Tons). It has the ancillary benefits of nitrogen fixation and thus a reasonably low fertility requirement.

Any assessment of a crop’s potential in a new region would be aided by the knowledge of the insect fauna that would be associated with its production. Insect pests of faba beans were broadly reviewed by Mustafa and Sharaf (1994) and Cammel and Way (1983) in England. Economically important faba bean insect pests include aphids that cause direct feeding damage and transmit plant viruses (e.g., *Aphis fabae* Scopoli, *A. craccivora* Koch, *Acyrtosiphon pisum* (Harris), and *Megoura viciae* Buckton) (Hemiptera: Aphidae), as well as leafhoppers, thrips, moth larvae, leafmining fly larvae, seed beetles and weevils. It is reasonable to assume that some of these insects would overlap onto faba beans, but an actively growing legume crop in the winter season could host additional insect species not typically found on warm season legumes. Aphids are considered by many to be the most important insect pests in agriculture. They primarily cause damage either by direct feeding and subsequent nutrient drain or by the transmission of plant viruses (Pickett *et al.*, 1992). They can also adversely affect crops through toxic compounds in saliva as well as reducing photosynthetic capacity indirectly in leaves through excretion products and saprophytic fungi (Schepers, 1989). The purpose of this research was to screen the effect of eight faba bean cultivars on the population build-up of the black bean aphid under rainfed conditions in Al-Jubeiha in Jordan (900 m above sea level).

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## 2. MATERIALS AND METHODS

Eight faba bean cultivars were acquired from the International Center for Agricultural Research in the Dry Areas (ICARDA). The used cultivars were B.L.L.2004, B.S.2004, B.M.2004, Jordan 2004, I.L.B.1814, Giza4/2000, I.L.B.1266 and Giza429/04. The cultivars were planted under field conditions on December 23, 2004 and grown through May 25, 2005 at the Agricultural Research Station of the University of Jordan in Al-Jubeiha area in Amman (900 m above sea level). Before planting, the soil was cultivated and subdivided into 3 blocks, then fertilized with DAP (Di-Ammonium Phosphate) with a rate of 2 kg for each block. Seeds were planted 25 cm apart in rows that spaced 50 cm on center. There were four rows per block for each cultivar. Three seeds of each cultivar were planted in a row with final plant density averaging four plants per row and 20 plants per block. The plants were grown insecticide free until the end of the experiment. No irrigation was applied and plants depended on rainfall. Weeding was done once on February 15, 2005.

Plants were examined weekly for presence of insects at various times from early morning to early evening. The following parameters were taken into consideration, number of *Aphis fabae*, number of colonies, number of infested plants and percentage of infested plants. Insects were identified by Dr Tawfiq Al-Antary of University of Jordan to species through the use of Blackman and Eastop (2000) and direct comparisons with museum specimens housed at the Department of Plant Protection, Faculty of Agriculture, University of Jordan.

## 3. RESULTS AND DISCUSSION

Faba bean aphid FBA was first noted on all the cultivars on April 4, 2005 in Al-Jubeiha (Fig.1). Numbers of aphids increased gradually until the populations reached the highest abundance on May 25, after which the crops dried and all aphid populations numbers declined rapidly on all the cultivars (Fig.1). On April 4, no significant differences were noted among the 8 cultivars numbers of aphids, aphid colonies and percentage of infested plants (Tables 1,2 and 3,

respectively). Variations in the numbers of aphid colonies were noted on April 20 and cultivar B.L.L.2004 sustained significantly the highest numbers of aphids and aphid colonies, but it showed no significant differences with the other cultivars, except that of cultivar Giza4/2000 (Tables 1 and 2, respectively). B.L.L. 2004 supported significantly higher percentage of infested plants, but it showed no significant differences with B.S.2004 and Giza 429/04 (Table 3). Giza4/2000, Jordan 2004 and B.M.2004 sustained low numbers of aphids and aphid colonies on April 27 (Tables 1 and 2, respectively). B.L.L.2004 sustained significantly higher percentage of infested plants (Table 3), but it showed no significant differences with B.S.2004, I.L.B. 1266 and Giza429/04. On May 10, B.M.2004, Giza4/2000 and Giza429/04 sustained low numbers of aphids and aphid colonies, and B.L.L. 2004 showed significantly higher numbers of aphids and aphid colonies on May 25 (Tables 1 and 2, respectively). There are a number of reasons why a particular plant would not be chosen by an aphid as a host. Nutrition, plant allomones, lack of specific phagostimulants and undesirable physical characteristics can all play a role. When a potential host plant is found to contain one or more unacceptable characteristics present, aphids will rarely remain on the plant until it dies. Even if the aphid can survive on the plant but only reproduce slowly, incoming alatae usually leave without settling (Gibson and Rice, 1989).

El-Jassani and El-Adel (1991) showed that the infestation of faba bean cultivars with *Aphis fabae* varied. The cultivars FAO 112, Kwadorji and Cobrocy were the most affected, whereas the cultivar FAO 121 was the least affected. A study was carried out by Younis and Hamoudi (1985) on three broad bean *Vicia faba* L. varieties 121 FAO, 268 FAO and Quaderchi, differing in degree of infestation with black broad bean aphid *A. fabae* Scop. The study aimed at finding the effect of varietal differences on the biology of this insect. It was found that rate of growth, reproduction and survival of the insect were significantly affected by variety at the same temperature and relative humidity.

It was obvious that cultivar B.L.L. 2004 supported significantly higher numbers of aphids, aphid colonies and percentage of infested plants.

**Table 1: Mean number of *Aphis fabae* on eight faba bean cultivars in Al-Jubeiha field during spring 2005.**

Cultivar	Number of aphids/ plant/week $\pm$ SE				
	April 4	April 20	April 27	May 10	May 25
B.L.L.2004	544.0a $\pm$ 206.00	844.0a $\pm$ 31.00	5125a $\pm$ 1125.00	7875a $\pm$ 875.00	9500a $\pm$ 1000.00
B.S.2004	241.5a $\pm$ 116.50	350.0ab $\pm$ 213.00	3750ab $\pm$ 750.00	6125ab $\pm$ 875.00	7750ab $\pm$ 250.00
B.M.2004	150.0a $\pm$ 50.00	283.0ab $\pm$ 0.00	2000b $\pm$ 125.00	4500b $\pm$ 500.00	5563bc $\pm$ 62.50
Jordan 2004	135.0a $\pm$ 85.00	229.0ab $\pm$ 146.00	1713b $\pm$ 87.50	4625ab $\pm$ 1000.00	6250abc $\pm$ 875.00
I.L.B.1814	282.5a $\pm$ 187.50	406.5ab $\pm$ 106.50	2813ab $\pm$ 687.50	5938ab $\pm$ 687.50	6875abc $\pm$ 875.00
Giza4/2000	56.5a $\pm$ 6.50	125.0b $\pm$ 50.00	1563b $\pm$ 62.50	3125b $\pm$ 375.00	4125c $\pm$ 375.00
I.L.B.1266	641.5a $\pm$ 358.50	773.0ab $\pm$ 385.00	3750ab $\pm$ 1250.00	5563ab $\pm$ 1187.50	6250abc $\pm$ 1250.00
Giza429/04	281.5a $\pm$ 218.50	391.5ab $\pm$ 296.50	2775ab $\pm$ 1725.00	4100b $\pm$ 1900.00	5250bc $\pm$ 2250.00

Means within the same column with the same letter are not significantly different using LSD at 95 % confidence level.

**Table 2: Mean number of *Aphis fabae* colonies on eight faba bean cultivars in Al-Jubeiha field during spring 2005.**

Cultivar	Number of colonies /plant/week $\pm$ SE				
	April 4	April 20	April 27	May 10	May 25
B.L.L.2004	21.75a $\pm$ 8.25	33.75a $\pm$ 1.25	205.00a $\pm$ 45.00	315.00a $\pm$ 35.00	380.00a $\pm$ 40.00
B.S.2004	9.65a $\pm$ 4.65	14.00ab $\pm$ 8.50	150.00ab $\pm$ 30.00	245.00ab $\pm$ 35.00	310.00ab $\pm$ 10.00
B.M.2004	6.00a $\pm$ 2.00	11.30ab $\pm$ 0.00	80.00b $\pm$ 5.00	180.00b $\pm$ 20.00	222.50bc $\pm$ 2.50
Jordan 2004	5.40a $\pm$ 3.40	9.15ab $\pm$ 5.85	68.50b $\pm$ 3.50	185.00ab $\pm$ 40.00	250.00abc $\pm$ 35.00
I.L.B.1814	11.30a $\pm$ 7.50	16.25ab $\pm$ 4.25	112.50ab $\pm$ 27.50	237.50ab $\pm$ 27.50	275.00abc $\pm$ 35.00
Giza4/2000	2.25a $\pm$ 0.25	5.00b $\pm$ 2.00	62.50b $\pm$ 2.50	125.00b $\pm$ 15.00	165.00c $\pm$ 15.00
I.L.B.1266	25.65a $\pm$ 14.35	30.90ab $\pm$ 15.40	150.00ab $\pm$ 50.00	222.50ab $\pm$ 47.50	250.00abc $\pm$ 50.00
Giza429/04	11.25a $\pm$ 8.75	15.65ab $\pm$ 11.85	111.00ab $\pm$ 69.00	164.00b $\pm$ 76.00	210.00bc $\pm$ 90.00

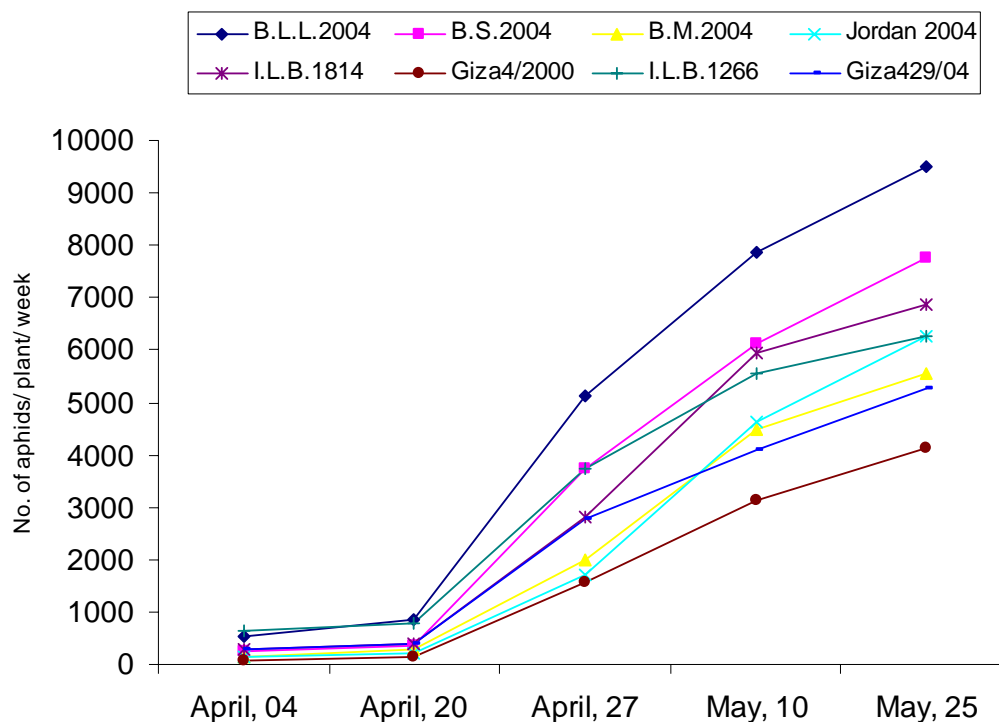
Means within the same column with the same letter are not significantly different using LSD at 95 % confidence level.

**Table 3: Mean percentage of infested plants with *Aphis fabae* on eight faba bean cultivars in Al-Jubeiha field during spring 2005.**

Cultivar	Percentage of infested plants/ week $\pm$ SE				
	April 4	April 20	April 27	May 10	May 25
B.L.L.2004	13.75a $\pm$ 6.25	27.50a $\pm$ 2.50	43.75a $\pm$ 6.2	71.25a $\pm$ 8.7	93.75a $\pm$ 6.25
B.S.2004	7.50a $\pm$ 2.50	11.25ab $\pm$ 6.25	30.00ab $\pm$ 5.00	60.00ab $\pm$ 10.00	77.50ab $\pm$ 15.00
B.M.2004	6.25a $\pm$ 1.25	10.00b $\pm$ 0.00	17.50b $\pm$ 2.50	50.00ab $\pm$ 12.50	67.50ab $\pm$ 12.50
Jordan 2004	5.00a $\pm$ 2.50	8.75b $\pm$ 3.75	16.25b $\pm$ 1.25	47.50ab $\pm$ 2.50	65.00ab $\pm$ 2.50
I.L.B.1814	8.75a $\pm$ 3.75	12.50ab $\pm$ 2.50	21.25b $\pm$ 6.25	43.75ab $\pm$ 6.25	53.75b $\pm$ 8.75
Giza4/2000	3.75a $\pm$ 1.25	6.25b $\pm$ 1.25	12.50b $\pm$ 0.00	32.50b $\pm$ 2.50	45.00b $\pm$ 5.00
I.L.B.1266	16.25a $\pm$ 8.75	21.25ab $\pm$ 8.75	30.00ab $\pm$ 10.00	55.00ab $\pm$ 15.00	71.25ab $\pm$ 8.75
Giza429/04	8.75a $\pm$ 6.25	12.50ab $\pm$ 7.50	25.00ab $\pm$ 12.50	46.25ab $\pm$ 16.25	66.25ab $\pm$ 21.25

Means within the same column with the same letter are not significantly different using LSD at 95 % confidence level.

**Fig. 1: Population trends of faba bean aphid on eight cultivars of faba bean from April 4 to May 25, 2005 in Al-Jubeiha in Jordan.**



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(B.L.L. 2004, B.S.2004, B.M.2004, Jordan 2004, I.L.B.1814, Giza4/2000, :  
 : .I.L.B.1266 and Giza429/04)  
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