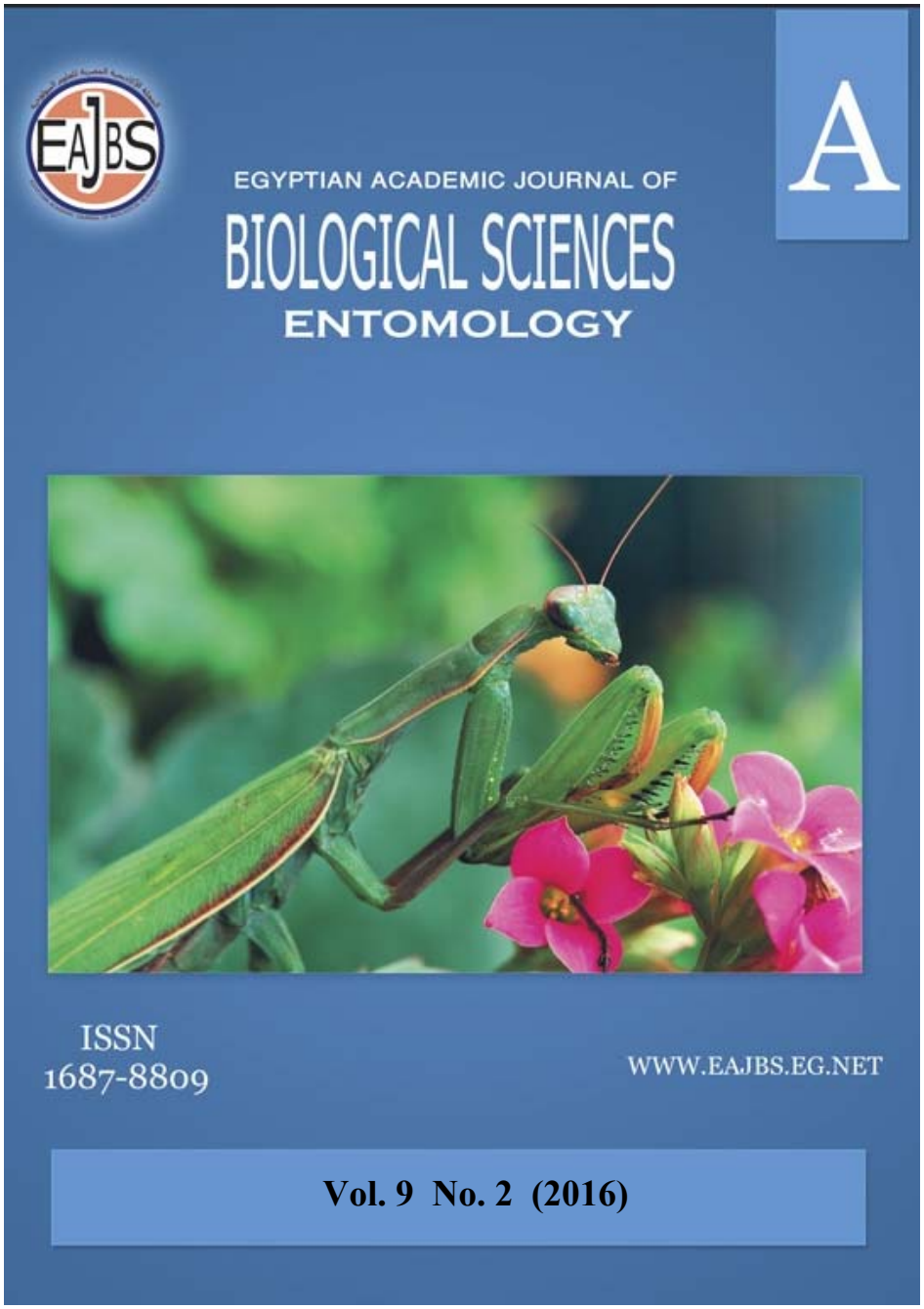

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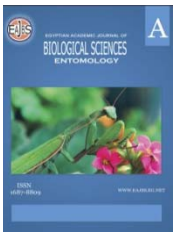

Feeding sequnce of *Aphis craccivora* koch by Different Levels of Infestation Density on Differenparts of Faba Bean under Labouratory Condition

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ABSTRACT

The present study was done to determine the effect and evaluate of three infestation levels 0, 5 and 10 aphids (*Aphis craccivora* Koch) / plant on faba bean, *V. faba* L. plans (Giza 402 cv.) at different parts and statues of plant over four infestation periods. The result of this study showed that significant effect of initial aphid infestation, time of infestation and periods after infection (feeding period) all treatments, on the weight of both shoot and roots (fresh and dry) and the plant height. Faba bean plants were died at the fourth week after infestation. *A. craccivora* individuals were developed during low infestation level (5 individuals) and significant but less than numbers during high initial infestation (10 individuals).

INTRODUCTION

In the last two decades in Egypt, the national production of faba bean is limited to a greater extent due to the losses caused by the cowpea aphid pest (*Aphis craccivora* Koch). Cowpea aphid, *Aphis craccivora* Koch, accounts mostly for a destructive pest attacking faba bean, *Vicia faba* L. This aphid species become a major pest of faba bean crop in most conditions, resulting on occasion in a complete weakness of crop productivity, Abd El- Wareth (2005). Aphids are important piercing-sucking insects that during feeding feeding cause significant loss of a plant's phloem sap, which is essential for plant growth (Dixon 1998).Indirectly, cowpea aphid also disturbs the photosynthesis process by the presence of fungus on the leaves that is supported by the aphids' honeydew secretion (Klingler *et al.* 2001) and (Smith and Boyko,2007). Plant damage increases because of the aphids' role as vectors for numerous plant viruses (Aldryhim and Khalil 1993) and (Smith and Boyko, 2007), such as faba bean necrotic yellow virus , broad bean yellow mosaic virus, and bean leaf roll virus (Weigand and Bishara , 1991). Cowpea aphids as a pest of faba bean, *Viciafaba* L. (Family: *Fabaceae*), are increasingly more important because of their higher occurrence in the field and increased deleterious effects on plants (Weigand and Bishara, 1991).

Therefore, this investigation aims to study the role of different initial cowpea aphid insect densities on the rates of growth of *V. faba* and the responses to different parts of plant (fresh or dry), which may be helpful in (IPM) crops management in faba bean.

MATERIALS AND METHODS

The current experimental was carried out under room condition from February till the end of April 2016 at a temperature 22±5c° and 60-80%RH to take a pure generation of aphid insects and complete the experimental. Culture of *A. craccivora* was collected from infested faba bean fields in Fayoum governorate, Sennoris district. Aphid insects were put plastic potted (20cm diameter and 25 tall), *V. faba* plans (Giza 402 cv). To estimate the effect of cowpea aphids on some vegetative growth of faba bean plants were planted in pots filled with a mixture of fine soil; sand and peat moss (1:1:1) at a density of two seeds/pot, which kept under room conditions, (Soffan and Aldawood , 2014).Seven days after emergence, seedling were thinned to a single plant for each pot. Faba bean plants were watered every 2-3 days and fertilized once shortly after emergence by Diammonium phosphphate (DPA) (18:46:0) (Dap Dap company) 8 granules/pot according, (Saffon and Aldawood, 2014).

Pots were divided into two experimental sets. In the first series, aphids were introduced into the plant at 14 days after seedling emergence, whereas the plants in the second experimental series were infected with the same number of aphids at 21 days post-emergence. In each set the effect of aphid feeding on host plant were assessed at initial population levels of 0,5 and 10 aphid/plant over three periods 1, 2 and 3 weeks. For all treatments, aphids were transferred to the top of each plant using a fine camel-hair brush no. zero.

Each experimental was divided into three groups each group included (50) pots for each level infestation inter breeding room. After artificial infestation, all treatments were covered with muslin cloth that was mounted over benches in order to prevent aphid's contamination between treatments. Thought study, ten plants were taking randomly from each treatment /level infestation.

Aphid's was counted at 7 days intervals. Water was used gently to remove the residues of soil from plat leaves. Plants were separated into shoots and roots to weight its fresh and dry separately and recorded. The two parts of plant were put in oven dried under 75c° for 72 h. after that it was weighted to determine the dry weight using electric sensitive balance to a constant weight (Laamari *et al.*,2008). Plant height was measured from the soil level to the tip of the plant using tap line.

Statistical analyses of all treatments were analyzed according to, (Duncan, 1955).

RESULTS AND DISCUSSION

Shoots:

Data presented in Table (1) clear that the two levels of cowpea aphids 5 and 10 individuals/ plant over 1, 2 and 3 weeks when the infestation began at 2 and 3 weeks after emergence plantation. Anyway, aphid feeding induced a significant decrease in the shoot fresh weight. Starting infestation by 5 aphids/plant, was reduced the relative shoot fresh weight from 84.9, 75.4 to 71.0% during 1, 2 and 3 weeks, respectively in comparison with the aphid-free plants. The second level,(10aphids/plant) were graduated decreasing the fresh shoot weight from 68.5 and 64.0 to 59.4% during 1, 2 and 3 weeks, respectively in comparison with the aphid-free plants. During the fourth week the plants were died in all treatments.

Table 1: Mean numbers and percentages of shoots fresh and dry weight (gm) after starting and three levels of infestation under room conditions.

Weeks	Levels	Fresh shoots				Dry shoots			
		Weeks after infestations							
		1	2	3	4	1	2	3	4
2	0	22.51a (100)*	54.94a (100)	66.00a (100)	-	3.23a (100)	6.73a (100)	7.53a (100)	-
	5	19.11b (84.9)	41.42b (75.4)	46.80b (71.0)	-	2.52b (78.0)	4.61b (68.5)	4.98b (66.10)	-
	10	15.42c (68.5)	35.11c (64.0)	39.21c (59.4)	-	1.64c (50.8)	3.02c (44.9)	3.80c (50.5)	-
3	0	60.34a (100)	92.03a (100)	147.04a (100)	-	7.14a (100)	10.37a (100)	14.85a (100)	-
	5	49.63b (82.3)	71.64b (77.8)	100.72b (68.5)	-	5.32b (74.5)	7.23b (69.7)	10.49b (70.6)	-
	10	36.54c 60.6)	54.58c (59.3)	82.16c (55.9)	-	3.56c (49.9)	4.84c (46.7)	9.55c (64.30)	-

Mean in a row with different letters are significantly different (P<0.05)

Statistical analysis of the data showed that significant differences between fresh shoot weight which infected by the two level infestations (5 and 10 individuals/plant) over 2 and 3 weeks (start infestation).

The same trend was appeared when the infestation was initiated on the second period of start infestation (3 weeks). The fresh shoot weight was significantly reduced by two infestation levels over 1, 2 and 3 weeks, respectively when compared to the relevant control.

Data in the same table show that a significant greater in dry shoot weight was founded on the zero infestation compared by the two levels of infestation.

Moreover, the dry weight was decreased as initial infestation level of aphids increased and calculated the decrease in dry weight due to infestation was determined as follows:

Decrease in dry weight (%) = (W1-W2/W1)*100 according (Laamari *et al.,* 2008)

Where W1: is the dry weight of non-infested plants (control) in grams, and W2: is the dry weight of infested plants, in grams.

The same trend but of greater magnitude was notified when infestation started after 2 and 3 weeks, respectively. Responses of dry plants that were attacked by 0, 5 and 10 individuals at a little later stage of plant development were similar to that for fresh parts of plant, except that aphid feeding did not cause plant to die during all periods of experiment.

Statistical analysis of the data clear that significant differences at (0.05%)between dry shoot weight which infected by the two level infestations (5 and 10 individuals/plant) over 2 and 3 weeks (start infestation).

The present study agree with the earlier studies on loss of quality and quantity of harvestable material of various vegetable crops such as brinjal (Chinniah *et al.,* 2009), tomato (Jayasinghe and Mallik, 2010) and okra (Geroh, 2011) due to *T. urticae* and aphid attacks. Also this results corroborated by Day (1984) reported the decrease in aphid numbers under such crowded population conditions could be blamed on the reducing nutrient quality of phloem sap. Kennedy and Stroyan (1959) found that, the competition between aphid individuals on the available food source causing aphids to feed on less nutrimental plant parts, which in its turn affect detrimentally the fecundity and developmental rate of aphids. Moreover when plants

wilt and stunt as a result of aphid attack, they turn into an interior food source for aphids and thus aphids commence to wander and nourish less leading ultimately to decelerating aphid abundance, (Barlow and Mesmer, 1982).

Roots:

According to Table (2), the percentage numbers of fresh root weight when infestation began on 2 weeks by 5 individuals for each plant declined the relative fresh weight from 89.8 and 72.4 to 76.1% comparing by the respectively aphid-free plants during 1, 2 and 3 weeks, respectively. However, infestation of 2 weeks by 10aphids lead to a 68.0, 61.6 and 61.7%reduction in the relative fresh root weight over the three weeks after initial infestation, respectively compared to the relevant control within each sampling date. During the fourth week the plants were died in all treatments.

The same effect was observed when plants were infested at a progressive growth stage, 3 week after emergence. The relative fresh root weight of plants infested with 5 aphids being 68.3, 63.3 and 72.8% of the respective control by weeks 1,2 and 3, in that order, whereas the reduction percentage of the root weight as a result of infestation by 10 individuals ranged between 57.5, 45.5 and 49.1% depending on the length of infestation period after infestation.

Table 2: Mean numbers and percentages of roots fresh and dry weight (gm) after starting and three levels of infestation under room conditions.

Weeks	Levels	Fresh roots				Dry roots			
		Weeks after infestations							
		1	2	3	4	1	2	3	4
2	0	30.99a (100)*	43.62a (100)	48.80a (100)	-	3.62a (100)	5.04a (100)	5.64a (100)	-
	5	27.84b (89.8)	31.56b (72.4)	37.16b (76.1)	-	2.90b (80.1)	3.69b (73.2)	4.24b (75.2)	-
	10	21.07c (68.0)	26.87c (61.6)	30.12c (61.7)	-	1.87c (51.7)	2.4c (47.6)	3.02c (53.5)	-
3	0	49.51a (100)	70.55a (100)	82.43a (100)	-	3.92a (100)	5.64a (100)	6.68a (100)	-
	5	33.83b (68.3)	44.68b (63.3)	60.02b (72.8)	-	2.58b (65.8)	4.08b (72.3)	5.24b (78.4)	-
	10	28.46c (57.5)	32.12c (45.5)	40.47c (49.1)	-	2.13c (54.3)	3.73c (66.1)	4.35c (65.1)	-

Mean in a row with different letters are significantly different ($P<0.05$)

Table (2) show that, the influence of different *A. craccivora* infestation levels on the dry root weight over two infestation periods at two growth stages of faba bean plants. Staring by five aphids on 2 weeks, the dry root reduced in weight from 80.1 and 73.2 to 75.2% for the three periods after infestation, respectively comparing by the respective in control. While, the dry root weight of faba bean plants infected by 10aphids declined from and 47.6 to 53.5% at 1, 2 and 3 weeks after infestation, respectively.

Statistical analysis of the data show that significant differences at (0.05%) inside fresh and dry root weight which infected by the two level infestations (5 and 10 individuals/plant) over 2 and 3 weeks (start infestation), as shown in table(2).

The second period of infestation (3 weeks) in the same table, detected that a significant differences between all treatments. Five individuals level was reduced the dry root weight from 65.8 and 72.3 to 78.4% during the three periods after infected

comparing by zero infestation, respectively. Nevertheless, the destroyed was greater at the second level of infestation. The dry root weight was decreased being 54.3, 66.1 and 65.1%, respectively comparing by control (zero aphids) over the three periods of sampling dates.

The present results are agreement with, Hawkins *et al.,* (1985) and Gray *et al.,* (1990) found that aphid-plant systems and the growth components of *V. faba* were clearly reduced by aphid feeding. All tested growth parameters responded almost in a similar manner to aphid injury where the damage increased in general with increasing infestation density, Barlow and Mesmer (1982). Park and Lee (2002) reported that the major principles behind yield loss due to pests, such as mites and aphids infestation in various crops have been established as biomass reduction, disturbance of water condition, dry matter partitioning, CO2 gas exchange, chlorophyll reduction and shedding of immature flowers.

Plant height:

Data in Table (3) clear that, there was a significant differences within all treatments and reduction in plant height resulting to infect by aphids comparing by to the control depends on the infestation starting and level thought the three periods after infestation.

The first period of infestation (2 weeks) in the same table, detected that a significant differences between all treatments. Five individuals level was reduced the plant height from 78.0 and 76.4 to 72.6% during the three periods after infected comparing by zero infestation, respectively. Nevertheless, the damage was greater at the second level of infestation by (10 aphids/plant). The plant height was decreased being 66.6, 64.9 and 63.2%, respectively comparing by control (zero aphids) over the three periods of sampling dates.

Table 3: Mean numbers and percentages of plant height (cm) after starting and three levels of infestation under room conditions.

Weeks	Levels	Weeks after infestations		
		1	2	3
2	0	25.43a(100)*	39.74a(100)	47.17a(100)
	5	19.82b(78.0)	30.35b(76.4)	34.24b(72.6)
	10	16.93c(66.6)	25.78c(64.9)	29.83c(63.2)
3	0	45.04a(100)	60.23a(100)	81.04a(100)
	5	39.22b(87.1)	49.78b(82.6)	68.95b(85.1)
	10	33.41c(74.2)	42.05c(69.8)	55.38c(68.3

Mean in a column / row with different letters are significantly different (P<0.05)

On the other hand, the second period of infestation (3 weeks) in the same table, detected that a significant differences between all treatments. Five aphids level was reduced the plant height from 87.1 and 82.6 to 85.1% during the three periods after infected comparing by zero infestation, respectively. Nevertheless, the damage was greater at the second level of infestation. The plant height was decreased being 74.2, 69.8 and 68.3%, respectively comparing by control (zero aphids) over the three periods of sampling dates.

Statistical analysis of the data show that significant differences at (0.05%)inside plant height (cm) which infected by the two level infestations (5 and

10 individuals/plant) over 2 and 3 weeks (start infestation) thought the three periods after infestation, as shown in Table (3).

The present results are agreement with, Hawkins *et al.,* (1985) and Gray *et al.,* (1990) found that aphid-plant systems and the growth components of *V. faba* were clearly reduced by aphid feeding. All tested growth parameters responded almost in a similar manner to aphid injury where the damage increased in general with increasing infestation density.

From the above mentioned results, it could be concluded that the different vegetative of faba bean and any plants was affected by feeding and initial density of aphids per plant. Also, this insect pest causes injury to faba bean plants and is still not recognized in this regards is highly valued.

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ARABIC SUMMERY

تتبع تغذية حشرات من اللوبيا بمستويات إصابة مختلفة الكثافة علي أجزاء مختلفة من نبات الفول في المعمل

حماده محمد عبد الحميد عبد الوارث
معهد بحوث وقاية النباتات- مركز البحوث الزراعية- الدقي- الجيزة- مصر12618

الدراسة الحالية تم اجرائها لمعرفة تاثير وتقييم ثلاث مستويات اصابة مختلفة لحشرات من اللوبيا وهي (صفر & خمسة & عشرة) حشرات / نبات فول بلدي صنف جيزة ٤٠٢ للتغذية علي الأفرع والجذور (الخضراء والجافة) خلال أربع فترات ما بعد الأصابة بين كل فترة والأخري أسبوع .

وأوضحت نتائج الدراسة أن هناك تأثير معنوي لمستويات الأصابة الثلاثة بالمن علي وزن كلا من الأفرع والجذور (سواء الخضراء منهاأوالجافة) وعلي ارتفاع النباتات.

و لوحظ أن نباتات الفول تموت في الأسبوع بعد الأصابة . وعلي الجانب الأخر لوحظ أيضا أن سرعة نمو وتطور حشرات من اللوبيا عند مستوي الأصابة المنخفض (٥ حشرات/نبات) أعلي مقارنة بمستوي الأصابة (١٠ حشرات/ نبات).