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INFLUENCE OF SOWING DATES, PLANT DENSITIES ON APHID, (*Aphis craccivora* KOCH) INFESTATION RATE, YIELD AND YIELD CHARACHTERISTICS OF TWO FABA BEAN CULTIVARS IN MINIA REGION

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ABSTRACT

A field yield trial was conducted under natural condition at Mallawi Agricultural Research Station, Minia Governorate during two successive winter seasons (2008/2009 and 2009/2010) to study the effect of sowing dates (15th October, 5th and 25th November), plant densities (22, 27 and 33 plants/m^2) and two faba bean cultivars (Giza 2 and Giza 843) on yield, yield components and aphid (*Aphis craccivora* Koch) infestation rate.

Results indicated that, sowing faba bean in November 5th recorded the lowest number of aphid/plant and gave the highest yield and yield components compared to either early or late sowing (October 15th and November 25th). Giza 843 cultivar record the lowest means of density of aphid (283.11 and 158.93 individuals/leaf/100 plants), as well as produced the highest seed yield (9.59 and 8.84 ard.fed) in two seasons, respectively. However, the highest density of aphids (389.11 and 206.19 aphids/100 plants and seed yields (7.69 and 6.15 ard./fed.) recorded from Giza 2 cultivar in the first and second seasons. Aphid infestation rate and plant height (cm) were progressively increased with increasing plant density from 22 to 33 plants/m^2. While number of, branches, pods, seeds and seed yield (g) per plant were decreased with increasing plant density. On the other hand, the highest seed index and seed yield (ard./fed.) were recorded with 27 plants/m^2 in both seasons. The lowest population of *A. craccivora* (63.7 and 6.67 individuals/100 plants) and the highest seed yield (14.07 and 13.10 ard./fed.) were obtained from sowing Giza 843 cultivar on November 5th and 27 plants/m^2 in both seasons. It could be concluded that Giza 843 with 27 plants/m^2 and sowing at November 5th maximize faba bean productivity, decreases aphid and virus infestation.

INTRODUCTION

Faba bean (*Vicia faba* L.) is one of the most important legume crops grown in Egypt. Seeds are used either as fresh vegetable or dried for human. The production in is still limited and fails to face the increasing local consumption of the crop. The national cultivated area was decreased from 390044 feddans in 1992 to 170106 feddans in 2008 and decreased from 101285 to 3262 feddans in Minia Governorate in the same period. Faba bean production can be severely affected by several biotic stresses such as viruses, aphids. Damage caused by aphids occurs directly due to sucking plant (phloem) sap and excrete honeydew that hamper photosynthesis and render flower buds unmarketable or indirectly by transmitting many virus diseases .(Attia and Hamaky, 1992 and El-Deeb, 2008). The cowpea aphids,

(*Aphis craccivora* Koch and the black bean aphid, Aphis faba scop are the major pests on faba bean in Egypt through December to April and causes about 55 to 85% losses in seed yield (El-Defrawi *et al* 1994). The aforementioned aphid species are considered an efficient a vector of several viral diseases i,e. Faba Bean Necrotic Yellow Virus (FBNYV), Bean Leaf Roll Virus (BLRV) and Bean Yellow Mosaic (BYMV) which could result in a complete crop failure of faba bean in Egypt. So, increasing faba bean production is one of the major targets of agricultural policy which could be achieved through using better integrated crop managements. In this connection, (Hussein *et al*, 2005).stated that the integrated-control package application raised faba bean seed yield value by (18.2%), (23.4%), (9.7%) and (28.8%) in Dakahlia, Beheira, Beni-seuf and Minia Governorates, respectively. Plant density, resistance cultivar and sowing dates plays a major role in yield improvement of faba bean especially in Middle Egypt to avoid aphid and virus diseaies (Khalil and Thompson, 1982 and Hussien *et al*, 2001) and Hussein, *et al* (1999) stated that planting Giza 429 or Giza 674 with 27 plants/m^2 gave the higher seed yield (3.67 and 3.62 tons/ha. Respectively). El-Deeb, *et al* (2006) showed that planting 1706B/87/1999 genotype at 33 plants/m^2 on Mid-October resulted in the highest faba bean yields. Salman *et al*, (2007) showed there are significant negative correlation between *Aphis craccivora*, infestation and the seed yield of faba bean. The objective of this investigation is to study the effect of sowing dates, plant densities, faba bean cultivars and their interaction in control of *Aphis craccivora* and increasing faba bean productivity under Minia Governorate condition.

MATERIALS AND METHODS

A field yield trial was conducted at Mallawi Agricultural Research Station, Minia Governorate, ARC, during two successive winter seasons 2008/2009 and 2009/2010. The purpose of this investigation to study the impact of sowing dates and plant densities on yield, yield components and aphid infestation rate of two faba bean cultivars.

The following treatments were studied:

A: Sowing dates: (main plots)

15^{th} October , 5^{th} November and 25^{th} November

B: Cultivars (sub-plots)

Giza 2 and Giza 843

C: Plant densities (sub-sub plots)

1- 22 plants/m^2 (two rows on the ridge, 2 seeds/hill, 30 cm apart).
2- 27 plants/m^2 (two rows on the ridge, 2 seeds/hill, 25 cm apart).
3- 33 plants/m^2 (two rows on the ridge, 2 seeds/hill, 20 cm apart).

The treatments were arranged in a split split plot design with four replications. The sowing dates were set up randomly in the main plots, while the two cultivars were arranged at random in the sub plots. Plant densities were randomly allocated in sub-sub plots. Each experimental plot contained five ridges, 3.5m in length and 60 cm apart, occupying and area of 10.5 m^2

(1/400 feddan). The agricultural practices were applied as recommended. Number of aphids (a late and apterous) per plant were counted an infested leaves at weekly beginning fifteen days after sowing. Thus, the average and monthly population of aphid was calculated. At harvest, ten plants were taken at random from each plot on which the following characteristics were recorded: number of days to 50% flowering, plant height, number of branches, pods, seeds and seed yield per plant. Moreover, seed yield (ard./fed.) and 100-seed weight (grams) were calculated.

The analysis of variance was used for this study according to Snedecor and Cochran (1981).

RESULTS AND DISCUSSION

1- Effect of sowing dates:

a- *Aphis Craccivora* kock infestation:

Data presented in Table (1) expressed number of aphid plant varied significant according to sowing dates in both seasons. Planting in November, 5th received the lowest infestation level (86.1 and 12.06 aphids on leaves of 100 plants) in both seasons in the same order. On the other hand, the highest population of *A. craccivora* (905.3 and 482.94 aphids/100 plants) was recorded in the earliest sowing date (Octoper 15th), in both seasons, respectively. These results agree with Hussein *et al*., 2005.

b- Yield and yield charachteristics :

Results in Table (1) showed that planting faba bean in November 5th resulted in the highest seed yield (11.61 and 10.16 ardab/fed) in both seasons, respectively. The prodactivly decreased with earlying or delaying sowing dates (October 15th and November 25$^{th)}$ and recorded 3.67 and 5.25 ard/fed. in the first season and 3.33 and 4.65 ard/fed. in the second season, respectively. In this connection, plant height, number of branches, pods and seeds per plant, 100-seed weight (gm) and seed yield plant (gm) were superior significantly with sowing in November 5th in both seasons. It could be concluded that the recommended planting date (November 5th) gave the highest yield and its components than other sowing dates, this may be related to the convenience of dominated climatic factors during this sowing date for growth faba bean plants. Similar results were obtained by Mc Ewen *et al*. (1988) and El-Deeb *et al*. (2006).

2- Effect of cultivars.

a- *Aphis craccivora* koch infestation:

Data in Table (2) showed that Giza 843 recorded significantly lowest means of aphid density (283.11 and 158.93 individuals/leaf/100 plants) compared with the highest degrees of infestation was found on plants of Giza 2 cultivar (389.11 and 206.19 aphids/100 plants) in both seasons, respectively. Data obtained are in agreement with results reported by El-Defrawi and El-Sayad, (2002). They reported that, in spite of the servere aphid infestation seasons in faba bean, two genotypes namely shambat 120033 and 120331 were found to be resistant/tolerant combined with high

yielding ability. Most of variation in yield components of faba bean genotypes were attributable to the size of *A. craccivora* infestation.

Table 1: Effect of sowing dates in relation to *Aphis craccivora* infestation, yield and yield components at Minia region, 2008-2010 seasons.

Season	Sowing date	Number of Aphids 100 plants	Plant height (cm)	Number of days to 50% flowering	Number of branches/plant	Number of pods/plant	Number of seeds/plant	100- seed weight (gm)	Seed yield/plant (gm)	Seed yield (ard./fed)
2008/09	Oct.15	905.5	119.01	45.34	3.95	11.93	34.35	63.77	21.4	7.94
	Nov. 5	86.1	125.39	48.06	5.41	15.06	41.51	73.85	29.2	11.61
	Nov.25	349.9	69.17	53.00	2.73	7.57	20.46	57.27	10.7	6.36
L.S.D $_{0.05}$		211.6	5.38	2.16	1.01	3.92	5.68	5.12	4.90	1.05
2009/10	Oct. 15	482.94	109.89	44.11	2.58	10.82	28.82	62.27	20.03	6.83
	Nov. 5	12.06	113.94	53.28	3.71	13.89	37.84	71.72	28.12	10.16
	Nov.25	52.67	53.61	57.17	1.97	7.16	19.86	56.06	10.04	5.51
L.S.D $_{0.05}$		105.10	3.06	3.11	0.61	2.64	6.58	6.01	6.06	1.02

Table 2: Effect of cultivars in relation to *Aphis craccivora* infestation, yield and yield components at Minia region, 2008-2010 seasons.

Season	Cultivar	Number of Aphids 100 plants	Plant height (cm)	Number of days to 50% flowering	Number of branches/plant	Number of pods/plant	Number of seeds/plant	100- seed weight (gm)	Seed yield/plant (gm)	Seed yield (ard./fed)
2008/09	Giza 2	389.11	96.63	45.56	3.22	11.92	26.63	60.96	16.70	7.69
	Giza 843	283.11	112.41	52.89	4.17	15.80	37.58	68.97	24.2	9.59
L.S.D $_{0.05}$		58.93	9.80	4.32	0.61	2.51	5.46	3.58	4.18	1.12
2009/10	Giza 2	206.19	86.26	48.37	2.30	8.71	23.73	58.95	15.45	6.15
	Giza 843	158.93	98.70	54.67	3.20	12.54	33.95	67.75	23.34	8.84
L.S.D $_{0.05}$		41.7	7.62	4.01	0.61	2.36	6.68	5.14	3.38	1.15

b- Yield and yield charachteristic: Data in Table (2) indicated that the measured characters recorded significant differences as affected by faba bean cultivars. Giza 843 was superior significantly in seed yield (9.59 and 8.84 ard./fed.) than Giza 2 (7.69 and 6.15 ard./fed.) in two seasons, respectively. Similar trend for yield components were obtained. These results agree with those obtained by (Hussein *et al*., (1994).

3- Effect of plant densities:-

a- *Aphis Craccivora* Koch infestation.

Data in Table (2) indicated that the rate of *A. craccivora* infestation increased by decreasing planting space in two seasons. Planting at 33

plants/m^2 recorded the highest number of aphid density (548.3 and 240 individuals/leaf/100 plants). Meanwhile planting at 22 plants/m^2 produced the lowest number of aphid density (336.1 and 146.33 aphids/100 plants) in both seasons, respectively. The present results agree with those of El-Defrawi *et al*. (2002). They reported sowing Giza 674 at 25-33 plants/m^2 could be successfully maximized yields and minimizing yield damage caused by aphid infestation.

b- Yield and yield charachteristic:

Plant densities had significant effect on faba bean yields and its components Table (3). Planting with 33 plants/m^2 recorded the lowest seed yield (7.98 and 6.78 ard./fed.). This value significantly increased with decreasing the plant density to 27 plants/m^2 by 1.5 and 1.44 ard./fed. in both seasons, respectively, followed by significant differences with those sown at plant density of 22 plants/m^2. Regarding to yield components, number of branches, pods, and seeds per plant and seed weight plant (gm) significantly decreased with increasing plant density from 22 to 33 plants/m^2. Plant height (cm) was significantly increased with increasing plant density from high competition between faba bean plants under higher plant densities. There results agree with El-Deeb *et al*. (2006).

Table 3: Effect of plant densities in relation to *Aphis craccivora* infestation, yield and yield components at Minia region, 2008-2010 seasons.

Season	Plant density (plant/m^2)	Number of Aphids 100 plants	Plant height (cm)	Number of days to 50% flowering	Number of branches/ plant	Number of pods/plant	Number of seeds/plant	100- seed weight (gm)	Seed yield/plant (gm)	Seed yield (ard./fed)
2008/09	22	336.1	96.78	49.22	4.03	13.86	38.11	64.97	24.8	8.45
	27	456.9	102.89	49.22	3.76	11.66	33.11	66.94	20.8	9.48
	33	548.3	113.89	47.94	3.29	9.04	25.14	62.98	15.7	7.98
L.S.D $_{0.05}$		102.71	4.86	N.S	0.21	1.24	3.51	1.05	2.79	0.31
2009/10	22	146.33	87.44	52.33	3.01	12.83	33.39	63.80	23.92	7.49
	27	160.67	92.22	51.78	2.81	10.71	28.59	65.05	19.75	8.22
	33	240.67	97.78	50.44	2.34	8.33	22.53	61.21	14.52	6.78
L.S.D $_{0.05}$		10.8	3.28	N.S	0.39	1.32	4.18	1.08	3.24	0.23

4- Effect of sowing dates X cultivars interaction:

Data in Table (4) showed that significant effect on number of aphids/100 plants, days to 50% flowering and branches/plant, seed weight plant (gm), 100-sees weight (gm) and seed yield (ard./fed.). Planting Giza 2 cultivar in October 15th was recorded the highest number of aphids/100 plants (1119.7 and 550.67) earliest flowering plants (40.89 and 41.44) in both seasons, respectively. Meanwhile, planting Giza 843 in November 5th were recorded higher number of branches (5.84 and 4.40) with higher estimates of seed yield plant (gm) (33.7 and 32.96), 100-seed weight (gm) (78.07 and 76.4) and seed yield ard./fed. (12.86 and 12.13) in both seasons, respectively.

On the other hand, planting Giza 2 in November 25th recorded the lowest number of branches (2.41 and 1.60), seed yield/plant (gm) (8.2 and 7.38), 100-seed weight (gm) (51.72 and 50.11) and seed yield/ard.fed., (5.67 and 4.62) in both seasons, in the same order. Similar results were recorded by El-Borai and Radi (1992) and Hussein *et al*., 2004.

5- Effect of sowing dates X plant densities interaction:

Results in Table (5) show that significant differences in number of aphids/100 plants, plant height (cm) in both seasons and number of pods and seeds/plant in the second season, while seed yield/plant (gm) in first season. The highest infestation levels by *A. craccivora* (1094.3 and 691.4) was obtained from planting in October 15th with plant density 33 plants/m^2 in both seasons. While planting in November 5th with plant density 33 plants/m^2 was recorded the tallest plant. On other hand, planting in November 5th with plant density 22 plant/m^2 gave the highest number of pods and seeds/plant (15.75 and 42.62) in second season and seed yield plant (gm) (32.7) in first season, respectively. The lowest infestation levels was recorded from planting November 5th with plant density 22 plant/m^2 (76.3 and 9.00) in both seasons, as well as planting in November 25th with plant density 33 plant/m^2 were gave the lowest number of pods and seeds/plant (5.55 and 15.65) in second season, and seed weight plant (gm) 8.3 in first season, respectively. These results agree with those obtained by Hussein *et al*., 1994 and Emam *et al*., (2006).

7- Effect of cultivars X plant densities interaction:

Table (6) showed the minimum infestation rate with *A. craccivora* resulted from Giza 843 cultivar with plant density 22 plant/m^2 (283.11 and 136.6) individuals/100 plants in both seasons, respectively. On the other hand, the highest infestation was noticed by planting Giza 2 cultivar with plant density 33 plant/m^2 (677.9 and 284.8) aphids/100 plants in both seasons. Similar results were recorded by Salman *et al*., (2007) showed that the faba bean varieties were different in their susceptibility to the infestation with *A. craccivora*. Concerning the effect of interaction between plant densities and cultivars on seed yield/plant (gm) in both seasons, the results indicate that the highest seed yield/plant resulted from Giza 843 cultivar with sowing 22 plant/m^2. However the lowest seed weight/plant (gm) was obtained from Giza 2 cultivar with plant density 33 plant/m^2. These results agree with Hussien *et al*., (2001) who showed planting Giza 843 cultivar by 25 plant/m^2 on the first week of November recorded the highest seed in Minia region.

8- Effect of sowing dates X cultivars X plant densities interaction:

Data presented in Table (7 and 8) revealed significant effect for sowing dates, faba bean cultivars and plant density interaction on the rate of infestation by *A. craccivora* as monitored by number of aphids/plant, yield and its components. Sowing Giza 2 cultivar in October 15th at plant density 33 plants/m^2 gave the highest infestation levels with mean number of aphids individuals/100 plants (1351.0 and 763.67), whereas, sowing Giza 843 cultivar in November 25th at plant density 22 plants/m^2 recorded the lowest of aphids number /100 plants (63.7 and 6.67) in both seasons, respectively. Concerning the effect of interaction between sowing dates, cultivars and plant density on 100-seed weight (gm) and seed yield (ard./fed.).

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The data indicated that the highest 100-seed weight and seed yield (ard./fed.) resulted from sowing Giza 843 cultivar in November 5th at plant density 27 plants (m^2) in both seasons. The highest number of seeds/plant was obtained from sowing Giza 843 in November 5th at plant density 22 plants/m^2 in first season. On the other hand sowing Giza 843 cultivar on November 25th at plant density 27 plants/m^2 had earlier flowering plants in the first season. Similar results were recorded by Hussein *et al*., (2004) and El-Deeb *et al*., (2006).

It is could be concluded that sowing Giza 843 cultivar in November 5th at plant density 27 plants/m^2 in Minia region because the increase faba bean productivity, decrease production costs and reduce environmental pollution through avoiding or minimizing the use insecticides in faba bean fields in such region.

The minimum, maximum and mean daily temperature as well as relative humidity at intervals during the growing seasons are shown in Table 1.

Table 1: Temperature and relative humidity prevailed during 2008/2009 and 2009/2010 seasons.

Months	First season (2008/2009)				Second season (2009/2010)			
	Temperature		Mean daily Temp.	Relative humidity	Temperature		Mean daily Temp.	Relative humidity
	Min	Mix			Min	Mix		
October	16.2	29.9	23.5	69.1	17.9	31.7	24.8	72.5
November	12.1	27.5	19.8	68.4	11.8	24.8	18.3	79.1
December	6.7	22.9	14.8	80.5	7.9	23.0	15.5	78.8
January	4.8	19.8	12.3	78.4	5.6	23.3	14.5	77.4
February	4.8	18.7	11.8	73.6	8.7	24.8	16.8	72.6
March	7.5	24.1	15.8	70.8	11.4	29.4	20.4	69.0
April	13.7	31.7	22.7	63.1	14.1	32.3	23.2	61.2

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تأثير مواعيد الزراعة والكثافة النباتية على الإصابة بمن البقوليات والمحصول ومكوناته لصنفين من محصول الفول البلدى بمحافظة المنيا

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أقيمت تجربة حقلية بمحطة البحوث الزراعية بملوى- محافظة المنيا- خلال الموسمين 2008/2009، 2009/2010 لدراسة سلوك صنفى الفول البلدى (جيزة 2، جيزة 843) تحت ثلاثة مواعيد زراعة مختلفة (15 أكتوبر، 5 نوفمبر، 25 نوفمبر) وثلاث كثافات نباتية (22، 27، 33 نبات/م^2) وتأثيرهما المشترك على نسب الإصابة بمن البقوليات وارتباط ذلك بالمحصول ومكوناته وقد أشارت النتائج الى:

١ - الصنف جيزة 843 سجل أقل كثافة لتعداد حشرة المن (283.11، 158.93 حورية/100 نبات) والذى انعكس على المحصول واعطى أعلى محصول من البذور ومكوناته (9.59، 8.84 أردب/فدان)، بينما سجل الصنف جيزة 2 أكثر تعداداً لحشرة المن (389.11، 210.19 فرداً/100 نبات)واقل انتاجيه من البذور (7.69، 6.15 أردب/فدان) فى كلا الموسمين على التوالى.

٢ - ميعاد الزراعة (5 نوفمبر) أدى الى نقص معنوى فى تعداد كثافة المن وزيادة معنوية فى إنتاجية المحصول ومكوناته مقارنة سواء بالميعاد المبكر (15 أكتوبر) أو الميعاد المتأخر (25 نوفمبر).

٣ - الكثافة النباتية 27 نبات/م^2 سجلت أقل نسبة إصابة بمن البقوليات و أعلى محصول من البذور ومكوناته تلاها الكثافة 22 نبات/م^2، بينما سجلت الكثافة 33 نبات/م^2 أكثر إصابة بمن البقوليات والذى انعكس على المحصول ومكوناته.

٤ - كان للتأثير المشترك بين كل هذه العوامل تأثيراً معنوياً على معدل الإصابة بمن البقوليات وكذلك على المحصول ومكوناته فى كلا الموسمين ونستخلص من هذه الدراسة أنه تحت ظروف منطقة المنيا يتم زراعة صنف جيزة 843 خلال الأسبوع الأول من نوفمبر وبكثافة نباتية 27 نبات/م^2 للحصول على أعلى إنتاجية وأقل إصابة بحشرة المن مما يخفض تكاليف الإنتاج ويحافظ على البيئة من التلوث بخفض أو منع إستخدام المبيدات الحشرية فى حقول الفول البلدى.

قام بتحكيم البحث

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Table 4: Interaction effect between sowing dates and cultivars on *Aphis craccivora* infestation, yield and its components of faba bean at Minia region, 2008-2010 seasons.

Season	2008/2009											
Characters	Number of Aphids 100 /plants		Number of days to 50% flowering		Number of branches/plant		100- seed weight (gm)		Seed yield/plant (gm)		Seed yield (ard./fed)	
	B_1	B_2	B_1	B_2	B_1	B_2	B_1	B_2	B_1	B_2	B_1	B_2
A_1	119.7	690.9	40.89	49.78	3.10	4.08	61.52	66.01	17.2	25.7	7.02	8.87
A_2	97.2	75.0	44.67	51.44	4.15	5.84	69.63	78.07	24.7	33.7	10.37	12.86
A_3	447.8	252.1	50.00	56.00	2.41	2.59	51.72	62.82	8.2	13.2	5.67	7.04
L.S.D $_{0.05}$	120.1		2.32		0.67		4.86		3.22		1.12	
Season	2009/2010											
A_1	550.67	415.22	41.44	46.78	2.29	2.88	59.7	64.84	15.7	24.36	5.82	7.83
A_2	13.78	10.33	50.67	55.89	3.01	4.40	67.04	76.40	23.37	32.96	8.01	12.13
A_3	54.11	51.22	53.00	61.33	1.60	2.33	50.11	62.01	7.38	12.71	4.62	6.39
L.S.D $_{0.05}$	50.04		2.06		0.51		3.24		3.56		1.01	

Table 5: Interaction effect between sowing dates and plant densities on *Aphis craccivora* infestation, yield and its components of faba bean at Minia region, 2008-2010 seasons.

Season	2008/2009														
Characters	Number of Aphids/ 100 plants			Plant height (cm)			Number of pods/plant			Number of seeds/plant			Seed yield plant (gm)		
	C_1	C_2	C_3	C_1	C_2	C_3	C_1	C_2	C_3	C_1	C_2	C_3	C_1	C_2	C_3
A_1	664.0	957.5	1094.3	111.2	117.5	128.3	15.15	12.28	8.35	44.70	34.93	23.42	28.6	21.5	14.2
A_2	76.30	84.3	97.7	113.3	122.8	140.0	17.2	15.20	12.83	45.58	43.15	35.78	32.7	30.2	24.6
A_3	268.0	329.0	452.8	65.8	68.3	73.3	9.27	7.52	5.93	23.90	21.23	16.23	13.2	10.6	8.3
L.S.D $_{0.05}$	105.3			4.94			N.S			N.S			2.92		
Season	2009/2010														
A_1	389.8	422.8	691.4	106.7	109.5	113.5	14.0	11.00	7.45	39.63	28.07	18.75	27.23	20.0	12.85
A_2	9.00	12.3	14.8	108.8	113.0	120.0	15.75	13.93	12.0	42.62	37.7	33.2	32.02	29.05	23.28
A_3	46.8	66.0	349.9	46.8	54.2	58.8	8.73	7.20	5.55	23.93	20.0	15.65	12.52	10.2	7.42
L.S.D $_{0.05}$	20.06			2.13			1.18			3.18			N.S		

Table 6: Interaction effect between faba bean cultivars and plant densities on *Aphis craccivora* infestation, yield and yield components at Minia region, 2008-2010 seasons.

Season	2008/2009						2009/2010					
Characters	Number of Aphids/ 100 plants			Seed yield/plant (gm)			Number of Aphids/ 100 plants			Seed yield/plant (gm)		
B	C_1	C_2	C_3	C_1	C_2	C_3	C_1	C_2	C_3	C_1	C_2	C_3
B_1	389.11	597.7	677.9	21.68	16.50	11.91	156.1	177.7	284.8	20.16	15.42	10.77
B_2	283.11	316.2	418.7	28.03	25.06	19.50	136.6	143.7	196.6	27.69	24.08	18.27
L.S.D $_{0.05}$	70.3			3.31			16.36			2.11		

Table 7: Interaction effect of sowing dates, cultivars and plant densities on *Aphis craccivora* infestation, yield and yield components at Minia region, 2008-2009 seasons.

Sowing dates	Cultivars	Plant density/plant/m^2	Number of Aphids 100/ plants	Number of days to 50% flowering	Number of seeds/plant	100- seed weight (gm)	Seed yield (ard./fed)
October 15th	Giza 2	22	752.3	41.67	40.0	62.23	6.73
		27	1255.7	41.33	28.53	64.23	7.80
		33	1351.0	39.67	17.2	58.10	6.53
	Giza 843	22	575.7	50.67	49.40	66.33	8.70
		27	659.5	49.67	41.33	66.63	9.53
		33	837.7	49.00	29.63	65.07	8.37
November 5th	Giza 2	22	326.0	44.33	39.63	67.93	10.13
		27	439.3	45.00	35.43	73.07	11.23
		33	578.0	44.67	29.43	67.90	9.73
	Giza 843	22	210.0	52.67	51.53	78.60	12.57
		27	218.7	51.67	50.86	79.73	14.07
		33	327.7	50.00	42.13	75.87	11.93
November 25th	Giza 2	22	89.0	50.67	20.63	51.80	5.43
		27	98.0	50.67	17.00	52.73	6.63
		33	104.7	48.67	11.83	50.63	4.93
	Giza 843	22	63.7	55.33	27.17	62.93	7.13
		27	70.7	57.00	25.47	65.25	7.63
		33	9.7	55.67	20.63	60.30	6.37
L.S.D $_{0.05}$			51.7	4.11	6.62	1.50	1.03

Table 8: Interaction effect between sowing dates, cultivars and plant densities on *Aphis craccivora* infestation, yield and yield components at Minia region, 2009-2010 seasons.

Sowing dates	Cultivars	Plant density/plant/m^2	Number of Aphids 100/ plants	Number of days to 50% flowering	Number of seeds/plant	100- seed weight (gm)	Seed yield (ard./fed)
October 15th	Giza 2	22	414.67	42.67	35.83	60.57	5.73
		27	473.67	42.00	20.34	61.83	6.90
		33	763.67	39.67	13.60	56.70	4.83
	Giza 843	22	355.00	49.67	43.43	64.77	7.70
		27	372.00	47.00	35.70	65.80	8.53
		33	518.67	46.33	23.90	63.97	7.27
November 5th	Giza 2	22	46.00	51.33	36.77	67.17	8.20
		27	48.00	51.00	33.70	68.60	8.47
		33	74.33	49.67	26.27	65.37	7.37
	Giza 843	22	42.33	56.67	48.47	77.33	12.43
		27	45.76	56.00	41.70	78.20	13.10
		33	57.67	55.00	40.13	73.67	11.40
November 25th	Giza 2	22	11.33	54.00	20.27	50.93	4.63
		27	13.67	53.00	15.37	51.60	5.20
		33	16.33	52.00	11.30	47.80	4.03
	Giza 843	22	6.67	62.33	27.60	62.03	6.23
		27	11.00	61.67	24.63	64.27	7.13
		33	13.33	60.00	20.00	59.73	5.80
L.S.D 0.05			31.6	N.S	N.S	3.48	1.06