RESULTS AND DISCUSSION

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The first part :

The characters studied were plant height, number of aphids/ 10 leaves , no. of leaf miner larvae and pupae and the percentage of infestation with leaf miner. Weekly samples started on 25 / 11 and 14 / 12 for the early planting date and 23/12 and 22/1 for the late planting date in the first and second seasons 1998/99 and 1999/2000, respectively.

A-Plant height

A.1.Effect of phosphorous fertilizer levels :

In the first planting date , the mean values of plant height during the first season in 16/1, 13/2, 24/2, 3/3 and 17/3 were affected by phosphorous fertilizer levels (Table 2). Whereas the other samples date were insignificant affected by phosphorous fertilizer levels. The plant height of faba bean in five sample dates (16/1, 13/2, 24/2, 3/3 and 17/3) significantly increased as the P- levels increased up to 60 Kg P_2O_5 / fed . It could be concluded that the P- fertilizer significantly increased the height of faba bean plants. These results may be attributed to the good effect of phosphorous on the vegetative or plant height of faba bean plants. This result confirm the data which obtained by

(Abdallah (1986a) who reported that the application of P-fertilizer increased plant height in faba bean

In the second season, mean values of plant height in 25/ 12, 1/1 , 9/1, 29/1, 7/2, 19/2, 5/3 and 25/3 in the early planting date were significantly increased as the P-levels increased up to 60 Kg p2 05 / fed Table (3)

As for the late of planting date, mean values of plant height in 13/2,24/2,3/3 and 17/3 in the first season Table (2) and in 15/1,W2, 19/2,5/3 and 25/3 in the second season (Table (3)) were significantly increased by increasing P-levels up to 60 Kg P2 05 / fed. The increase in plant height mazy be due to the stimulating effect of P-on metabolic process in faba bean plants . Similar results were obtained by (**Abdallah (1986b))**

2-Varietal performance

Data obtained in the first planting date (early planting date), showed that with the exception of samples dates in 18/11, 2/12, 23/,12, 1/1 and 9/1 in the first season and 4/12 in the second season, the mean values of plant height were significantly different between varieties Tables (4and 5)

Giza 3 gave the highest values of plant height at different samples in the first planting date in the first season . whereas the two varieties G.843 and G. 716 gave the lowest ones , in the second season. Giza 461 had the highest values of plant height

followed by G. 3 in all weekly samples in the first planting date. Whereas the two varieties G. 843 and G.716 gave the lowest ones.

In the second planting date (late planting), G.674 followed by G.3 gave the highest mean values . While , G. 716 and G 843 gave the lowest one in the first season. Meanwhile Giza 3 followed by G.674 gave the highest mean values of plant height. However , Giza 843 in 9/1, 15/1,22/1 and 29/1 and Giza 716 in the later samples gave the lowest ones. These differences may be due genetical differences between varieties . Also, the effect of planting date on performance in these varieties.

These result are in harmony with that obtained by **EI-Murabaa** *et al.* **(1987)** who reported significant differences in plant height between **all** cultivars under their studies.

3-Effect of interaction- between phosphorous fertilizer level and varieties

Insignificant effect of phosphorous fertilizer and varieties interaction was detected for plant height, consequently the date were excluded . such result indicates that cultivars showed similar response to phosphorus.

Samples date	11/81	I1/SZ	ZUZ	23/12	[redacted] I/I	1/6	1/91	[redacted]	[redacted]	[redacted]	£/£	E/L1	Average
Pzos Kg/ted	First planting (Early planting) date												
ci	[illegible]	17.834	25.147	31.040	L06 5£	09£"11Z	L41.813	£6t8g	£5Z 8g	ELCE9	L1707L	87.727	45.617 II
2	art'	0176"L1	009 5Z	£L1"Z£	£g0"9£	42.140	44.580	LZt6g	58.423	67.920	78.407	89.780	V1EIV
[illegible]	[illegible]	18.133	39.533	L9r1£	37.2331	0Z01717	47.260	£5C19	Ltfl£9	LKOL	00 178	L91176	sgros
ci•n "CI S 10 0	c'tsi	SN	£ L.1	SI\1	S"N	SN	9ZCZ £ 8g8		'1Z1:"£ 1719	1ZFE 9L IS	IEZ £ 65£S	1£F£ 15Z17	£9 O £10 1
Second planting (Late Planting) date													
	-			00171	Lenz	25.380	L31.587	0917"5S	53.020	L9Z'19	LZ0 69	L9£'06	5£9 91Z II
	-		-	ESZ Z1	EIZ1Z	ELZ1Z	£6S*1£	08£•95	09£Z5	I 64.773	080'1L	L089 Z6	47.733 II
	-		-	08971	22.847	00E'LZ	£6C1£	L1791g	56.413	ESCS9	L85 5L	L89'86	958 61Z II
S" 0•0g			-	sN	SN	sN	SN	N	L95'£	Z1 £	1817'£	Og97	LICA
10 0			-						SZ16	86917	160	06S £	

Samples date	[illegible]	[redacted]	25/12	1/1	[redacted]	[redacted]	[redacted]	[redacted]	[illegible]	[illegible]	[redacted]	12/3	
P_2O_5 Kg/fed			Early planting date										
[illegible]	[illegible]	[illegible]	24.430	31.262	38.370	[illegible]	[illegible]	I 55.510	61.440	[illegible]	I 92.430	I 90.780	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	33.152	[illegible]	[illegible]	[illegible]	[illegible]	70.570	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	53.204	[illegible]	[illegible]	[illegible]	103.22	[illegible]	1 54.103 11
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NS	NS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				Late Planting date									
[illegible]		·	–	[illegible]	22.500 I	[illegible]	[illegible]	[illegible]	[illegible]	63.848	63.840	[illegible]	54.808 11
[illegible]		·	–	[illegible]	24.624	[illegible]	[illegible]	[illegible]	51.428 I	[illegible]	[illegible]	[illegible]	45.297 11
[illegible]		·	–	[illegible]	25.796	[illegible]	36.436 I	[illegible]	54.280	67.832 1	[illegible]	83.320 1	46.784
						[illegible]	NS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]	-				[illegible]	[illegible]	[illegible]

Table (4):The average values of plant height of faba bean as affected by varieties in both planting dates in the first season (1998/1999).

Samples date	18/11	25/11	2/12	9/12	1/1	9/1	16/1	7/2	13/2	24/2	3/3	17/3	Average
Varieties	Early planting date												
G.3	14.756	19.689	25.422	32.267	38.411	45.122	50.044	68.778	63.444	75.644	85.822	98.833	51.519
G.461	13.533	18.779	25.222	32.489	37.078	42.378	45.022	54.267	58.933	66.667	80.922	98.767	47.838
G.674	14.400	17.356	26.111	31.622	36.722	43.411	47.789	64.178	68.856	71.178	75.622	99.589	49.736
G.716	13.800	16.244	25.400	30.044	34.822	41.589	41.389	55.900	53.911	58.722	70.600	75.133	43.129
G. 843	14.111	17.778	28.311	31.044	34.956	40.033	38.511	55.667	54.444	64.922	74.622	80.467	44.573
L. S. D. 0.05	Ns	1.000	Ns	Ns	Ns	Ns	2.260	6.340	5.640	4.760	5.830	9.050	1.359
0.01	-	1. 370	-	-	-	-	3.070	8.620	7.660	6.450	8.060	12.020	1.968
	Late Planting date												
G.3	-	-	-	13.311	22.778	27.733	33.011	58.167	53.300	66.422	73.989	99.578	49.909
G.461	-	-	-	13.289	21.000	25.922	30.967	55.133	52.856	60.333	71.800	96.267	47.507
G.674	-	-	-	12.800	20.667	28.378	33.267	62.222	57.422	67.633	74.311	97.189	50.432
G.716	-	-	-	11.244	21.522	25.544	27.633	51.989	51.889	60.689	68.256	88.378	45.238
G. 843	-	-	-	11.578	22.811	25.678	33.411	54.967	54.189	64.578	71.133	88.144	47.387
L. S. D. 0.05	-	-	-	0.670	Ns	2.121	1.910	4.420	Ns	3.998	4.128	4.656	1.216
0.01	-	-	-	0.91	-	2.879	2.590	5.990	-	5.418	5.594	6.309	1.649

Table (5): The average values of plant height of faba bean as affected by varieties in both planting dates in second season (1999/2000).

Samples date	18/11	25/11	2/12	23/12	1/1	9/1	16/1	7/2	13/2	24/2	3/3	17/3	Average
Varieties	Early planting date												
Giza3	14.756	19.689	25.422	32.267	38.411	45.122	50.044	68.778	63.444	75.644	85.822	98.833	54.22
Giza461	13.533	18.779	25.222	32.489	37.078	42.378	45.022	54.267	58.933	66.667	80.922	98.767	56.81
Giza674	14.400	17.356	26.111	31.622	36.722	43.411	47.789	64.178	68.856	71.178	75.622	99.589	54.543
Giza716	13.800	16.244	25.400	30.044	34.822	41.589	41.389	55.900	53.911	58.722	70.600	75.133	45.45
Giza843	14.111	17.778	28.311	31.044	34.956	40.033	38.511	55.667	54.444	64.922	74.622	80.467	49.188
L. S. D. 0.05	Ns	1.000	Ns	Ns	Ns	Ns	2.260	6.340	5.640	4.760	5.830	9.050	1.21
L. S. D. 0.01	-	1. 370	-	-	-	-	3.070	8.620	7.660	6.450	8.060	12.020	1.72
Late Planting date													
Giza3	13.850	19.660	27.600	34.210	41.820	47.367	53.747	60.580	71.800	85.140	104.060	90.810	48.267
Giza461	13.287	18.427	26.730	37.377	43.920	51.943	58.253	64.980	77.070	87.233	108.800	93.760	46.595
Giza674	14.250	17.917	26.280	33.033	40.280	47.853	54.850	62.630	74.270	83.107	104.030	96.010	46.234
Giza716	12.200	15.213	22.330	28.397	34.630	38.020	41.280	47.360	55.440	70.143	82.380	98.010	42.79
Giza843	12.017	13.823	24.870	31.930	40.800	44.350	49.697	55.570	61.030	72.903	92.360	90.910	42.789
L. S. D. 0.05	NS	1.920	1.720	2.012	1.380	2.670	2.991	2.960	3.070	3.246	3.630	3.490	1.03
L. S. D. 0.01		2.606	2.340	2.732	1.880	3.625	4.061	4.920	5.100	4.407	4.930	4.740	1.304

B- Aphids :-

The number of aphids on faba bean plants were recorded from 25/11 and 4/12 for the first planting date in the first and second seasons; and from 23/12 and 15/1 for the second planting date in the first and second season, respectively.

1- **Effect of phosphorous fertilizer levels**

The mean number of aphids as affected by phosphorous fertilizer in both planting dates during the both seasons are presented in Tables (6 and 7) .

Number of aphids on faba bean plants was significantly decreased by increasing P- levels up to 60 kg $p_{2}o_{s}$ / fed . in weekly samples of 2/22 , 23/12, 1/1,9/1 and 16/1 in the first season; and of 14/12, 25/12,1/1, 9/1,15/1, 22/1, 29/1 and 5/3 in the second season . While , in the second planting date , the number of aphids /10 leaves on faba bean was significantly decreased by increasing P- levels up to 60 kg $P_{2}0_{5}$ /fed at weekly samples 23/12, 1/1,9/1,16/1, 7/2 and 13/2 in the first season and at 22/1 in the second season . The average number of aphids in both seasons in each planting date significantly decreased by increasing P- levels up to 60 kg $P20_{5}$ / fed. The differences between the first planting date in both seasons may be due to differences between meteorological data in both

seasons (Table 1). Also, increased number of aphids in the early planting date than late one, may attributed to the different temperatures °C which affect the number of aphids. The effect of P-application on the number of aphids could be explained through the role of phosphorous which is extremely important as a structural part of many compounds notably nucleic acid and phospholipids. In addition, phosphorous plays an indispensable role in energy metabolism, the high energy of hydrolysis of pyrophosphate and various organic phosphate bonds being used to induce chemical reaction. As might be expected , phosphorous deficiency affects all as partes of plant metabolism and structure.

Similer results was reported by **Rote and Puri (1992)** who found that the insect population of *Bemesia tabaci* increased with increasing fertilizer dosage.

2- Varietal performance: -

The average values of aphid numbers as affected by varieties in both planting dates in both seasons are presented in Tables (8 and 9) .

Results in Table (8) revealed that the differences between varieties were significant for aphid numbers/10 leaves in all weekly samples in both planting dates as well as average over samples in the first season except both samples in 24/2 and 17/3

in early planting date. Meanwhile , results in Table (9) revealed that the differences between varieties were significant for aphid numbers/ 10 leaves in all weekly samples in both planting dates as well as the average over samples except samples in 5/3 and 12/3 in early planting date and 12/3 in late planting date.

In the first season . The lowest mean values of aphids were detected in early planting date by G.3, G.843, G3 ,G.843 , G.716 , G.461, G. 716 , G.461 , G.716 , G.716 and G.716 in 25/11, 2/12, 23/12 , 1/1 ,9/1 , 16/1 , 7/2 , 13/2, 24/2, 3/3, and 17/3 respectively. Also, in the late planting date G.3, G.716 G.843, G.3, G.461, G .461 , G.843, G.716 and G. 716 gave the lowest mean values of aphids number /10 plants on samples in 23/12, 1/1, 9/1, 16/1. 7/2, 13/2, 24/2, 3/3 and 17/3 respectiv ely, these differences in different weekly samples may b e due to the genetical differences between varieties and different in genetic expression in different stages.

The average number of aphids over different weekly samples, the lowest values 7.58 individuals/plant were detected by G. 3 followed by G. 843, 8.998 individuals and then by G.461 (9.56) in early planting date. While, G.3 followed G.461 and then G.843 in late planting date gave the lowest one recordin .99,3.17 and 3.54 individuals /10 plants respectively..

It could be concluded that the three varieties were considered the best to avoid the aphid infestation.

In the second season , the lowest aphid number /10 leaves on faba bean were obtained in early planting date by G. 461 , G. 674 , G. 461 , G.674 , G.843 , G.3 , G.461 , G.3 , G.3, G.843 and G.3 on weekly samples, 14/12 , 25/12, 1/1, 9/1 , 15/1, 22/1, 29/1, 7/2, 19/2, 5/3, and 12/3, respectively. while , in late planting date , the lowest mean values of aphids number /10 leaves were detected by G.3 , G.3, G.3, G. 461, G.674 and G.674, on weekly samples in 22/1, 29/1, 7/2, 19/2, 5/3, and 12/3 respectively .

The aphid number averages over eleven samples in the early planting, showed that G.674 attracted the lowest aphid number, but without significant superiority than G.3 , 0.461 and G.843. Meanwhile G.3 had the lowest number of aphids /10 leaves in late planting, but without significant differences than G.461, G.674. Generally from the result of the two seasons it may concluded that G.3 the best variety within the five tested from the side of aphid infestation avoiding followed by G. 461 and G. 674 .

Similar results were obtained by **Saleh** *el al.* **(1973), Mansour et al (1977)and Bastwisy** *et al* **(1998)** who reported that highly susceptible genotypes to aphid infestation Giza 3 while Giza 461 and 843 were relatively resistant.

3- Effect of interaction between varieties and phosphorous fertilizer levels.

The effect of interaction between varieties and phosphorous fertilizer levels on numbers of aphid in separate planting date in both seasons are presented in Tables 10,11,12 and 13.

Data in Table (10) indicate that phosphorous fertilizer levels and variety interaction in early planting date in the first season as well as the average over weekly samples showed a significant effect at samples in 25/11, 2/12, 23/12, 1/1, 9/1, 16/1 and 3/3 as well as the average over all samples . However , the rest samples had insignificant effect.

The application _of 0.0 P205 with G.674 in the first sample 25/11 and 60kg P205 with G.843 on sample 2/12, 60 kg P205 with G.3 on sample in 23/12 30 kg P205 with G.674 and 60kg P205 with G.3 on sample in 1/1, 60kg P205 with G. 716 on sample in 9/1, 60kg P205 with G. 3 on sample in 16/1 and 60 kg $P2O_5$ with G. 843 , 30kg P205 with G.461 and 0.0 P205 with G.674 on sample in 3/3 gave the lowest number of aphids/ 10 leaves in early planting date.

The application of 30 kg P_2O_5 with G.3 in the average of all samples gave the lowest value of number of aphid, but

without superiority over the application of 60 kg P_2O_5 with each of G.3 and G.843.

Data in Table (11) revealed that phosphorous fertilizer and variety interaction in early planting date in the second season as well as the average over weekly samples showed a significant effect of all samples as well as averages over them except sample in 3/3 .

The application of 60kg P_2O_5 / fed. with each of G.843, G.716 , G.461, G. 461, G.716 , G.461, G.3 and G. 716 gave the lowest number of aphids /10 leaves on samples 14/12, 25/12, 1/1, 9/1, 15/1, 22/1, 29/1, and 19/2, respectively. However, the non fertilized (control) with each of G. 461 and G.3 had the lowest number of aphids /10 leaves on samples 7/2 and 12/3, respectively.

In the averages over all weekly samples, the application of 60kg P205 / fed with G.716 gave the lowest number of aphids /10 leaves, but without significantly differences with the application of 60kg P205 /fed and each of G. 843 , G.674 and G.461.

It could be concluded that the varieties differed in their interaction with phosphorous levels from the side of aphid infestation. When the five varieties don't receive any phosphorous fertilizer. G.3 variety was the best one avoiding

aphid infestation in the first season and G.674 in the second season, when the varieties received 30kg P2O5 /fed. G.461variety was the least one in attracting aphid population in both seasons. Concerning the 60kg. level with G.843 variety was the best one in the first season and G.716 showed the lowest average of aphid in the second season

It could be concluded that both cvs. G. 716 followed by G.843 were considered the best varieties for decreased number of aphids in early planting date in both seasons.

Data in Table (12) revealed that phosphorous fertilizer and variety interaction in late planting date in the first season as well as the average over weekly samples showed a significant effect in all samples as well as averages over samples except samples in 24/2 and 17/3 the aphid infestation was start in 23/12 and 22/1 in the first and second seasons, respectively .

The application of 60 kg P2O5 / fed with G.716 on samples in 1/1 and 7/2;30kg P205 / fed with each of G.843 and G.3 on samples in 9/i and 16/1 respectively and 0.0 P205 with G.461 in 23/12 showed significant low number of aphids / 10 leaves. Also , application of 60kg or 30kg P_2O_5 with G. 461 and 0.0 P_2O_5 with G. 674 in 13/2 and 0.0 with G. 3 or G. 716 , 30 kg P2O5 with each of G. 716 and G. 843, and 60 kg $P2O_5$ with G. 461 in 3/3 gave the lowest number of aphids/10 leaves.

However, the application of 30kg P_2O_5 with G. 674 in 1/1 , 9/1, 16/1 and 7/2, 0.0 P_2O_5 with G. 461 in 23/12 and G. 674 in 3/3 and 60kg P_2O_5 with G. 716 in 13/2 gave the highest number of aphids /10 — leaves.

Application of 60kg P205 /fed with each of G. 716 followed by G. 843 and then G. 674 gave the lowest number of aphids /10 leaves in the averages over all weekly samples in late planting in the first season.

Data in Table (1-3) indicated that phosphorcus fertilizer and variety interaction in the second season and late planting date as well as the average over weekly samples showed a significant effect in all samples as well as the average over them.

The application of 60 kg P205 / fed with each of G. 461, G.716, G.3, G. 461 and G.461 gave the lowest number of aphids in 22/1, 29/1, 7/2, 19/2 and 5/3 respectively. However, G.716, G.461, G.716, G.716 and G.716 gave the highest number of aphids under control treatment (0.0 $P20_5$)at 22/1, 7/2, 19/2 , 5/3 and 12/3.

The application of 60kg P_2O_5 with G.461 gave the lowest value of number of aphids in the average over all weekly samples followed by G. 716. Also, over two planting dates (late planting) in both

Table (6): The mean number of aphids in the different levels of phosphorous

Samples date	25/11	2/12	23/12	1/1	9/1	16/1	7/2	13/2	24/2	3/3	17/3	Average
Late planting date												

in both planting date during the

Samples date	14/12	25/12	1/1	19/1	15/1	22/1	29/1	7/2	19/2	5/3	12/3	Average
Varieties	Early planting date											
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	21.330	82.940	20.327	[illegible]	12.600	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	24.940	57.600	21.493	[illegible]	22.480	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Giza843	25.290	78.000	24.694	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10 0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Late planing											
[illegible]			-	-	-	-	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
Giza461			-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Giza674			-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Giza843		-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.0g		-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10 0		-	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table (10): Average num[illegible]
first season

Sample date	[illegible]	[illegible]	[illegible]	1/1	9/1	16/1	7/2	13/2	24/2	3/3	17/3	
planting date												
[illegible]	15.967	33.467	35.500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.020	[illegible]
[illegible]	36.467	32.633	44.267	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	19.567	36.467	42.800	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	50.833	41.067	23.633	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	43.733	27.200	33.600	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	20.500	15.000	26.100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.667	27.267	24.067	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.833	29.433	45.933	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	44.067	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	27.133	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.100	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.100	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	14.333	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
				[illegible]	[illegible]	[illegible]	NS	NS	NS	0.060	NS	[illegible]
	[illegible]			[illegible]	[illegible]	[illegible]				[illegible]		[illegible]

i

Table (11): Average number of aphids as affected by varieties X phosphorous interaction during the second season (1999/2000).

Samples date		14/12	25/12	1/1	9/1	15/1	22/1	29/1	7/2	19/2	5/3	12/3	Average
[illegible]	[illegible]	Early planting date											
[illegible]	[illegible]	42.330	78.300	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	30.970	[illegible]	30.190	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	23.930	43.770	24.100		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	43.030	112.630	40.980	26.210	8.900	12.120	[illegible]	[illegible]	[illegible]	1.6000	[illegible]	[illegible]
	[illegible]	[illegible]	73.100	[illegible]	[illegible]	[illegible]	13.120	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	18.420	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	76.330	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		34.530	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0	[illegible]	18.600	[illegible]	[illegible]	13.102	12.330	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	70.970	12.371	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.800	[illegible]	12.480
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.600	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	41.330	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
	[illegible]	[illegible]	59.030	[illegible]	15.230	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		10.620	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	

Table (12): Average number of aphids as affected by varieties X phosphorous the first season (1998/1999).

P.	Samples date / cvs	23/12	1/1	9/1	16/1	7/2	13/2	24/2	3/3	17/3	Average
		Late planting date									
0.0	G.3	14.400	1.500	4.200	1.733	2.300	0.633	0.200	0.100	1.067	2.900
	G.461	12.667	2.500	5.067	5.667	2.967	0.867	0.200	0.300	0.533	3.400
	G.674	33.000	0.800	2.733	3.533	3.500	0.200	1.300	0.633	0.300	5.110
	G.716	18.933	0.933	4.967	6.800	6.733	0.300	0.600	0.100	0.100	4.385
	G.843	17.667	2.433	2.400	6.900	7.033	0.233	0.300	0.500	0.733	4.240
30	G.3	16.467	1.300	1.867	1.100	0.967	0.833	0.633	0.400	0.300	2.650
	G.461	17.067	0.500	3.233	3.167	1.067	0.200	0.733	0.400	0.400	2.970
	G.674	15.933	2.833	6.733	17.633	8.433	0.733	0.500	0.533	0.533	5.984
	G.716	27.300	1.067	3.300	3.600	4.300	0.300	0.400	0.100	0.200	4.500
	G.843	19.733	0.633	1.633	2.833	2.400	3.200	0.300	0.100	0.867	3.520
	G.3	18.467	1.067	2.867	5.200	2.200	0.300	0.400	0.300	0.100	3.430
60	G.461	20.333	0.567	2.867	2.367	1.200	0.200	0.300	0.100	0.300	3.130
	G.674	16.933	1.067	3.300	1.433	1.833	0.633	0.400	0.200	0.300	2.890
	G.716	13.467	0.300	2.067	3.400	0.633	1.067	0.400	0.400	0.500	2.470
	G.843	17.067	0.833	1.867	2.067	2.067	0.633	0.500	0.500	0.300	2.870
L.S.D.	0.05	4.760	0.420	0.836	1.101	1.365	0.515	NS	0.201	NS	0.783
	0.01	6.460	0.560	1.134	1.496	1.853	0.699	-	0.312	-	1.027

Table (13):Average number values of aphids as affected by varieties X phosphorous interaction in the second season 1999/2000 (late planting).

Samples		22/1	29/1	7/2	19/2	5/3	12/3 l	Mean
P2o5 Kg/fed.	Varieties	Late planting date						
0.0	Giza 3	2.967	2.200	2.040	2.410	2.400	0.533	2.041
	Giza 461	12.800	6.967	4.862	2.112	1.500	0.633	4.812
	Giza 674	7.333	4.033	3.012	2.671	2.033	0.367	3.240
	Giza 716	14.333	5.167	3.489	4.123	4.433	2.200	5.624
	Giza 843	29.470	4.900	3.886	3.567	2.300	0.767	7.481
30	Giza 3	5.167	3.667	2.010	2.310	4.233	1.367	3.125
	Giza 461	6.000	4.667	4.210	1.239	2.133	0.467	3.119
	Giza 674	9.400	3.600	2.676	1.619	0.400	0.700	3.065
	Giza 716	10.000	2.900	4.121	3.210	1.767	0.333	3.721
	Giza 843	16.767	3.667	3.261	1.234	1.100	0.533	4.427
60	Giza 3	6.267 -	1.600	1.989	1.976	1.867	0.533	2.372
	Giza 461	2.933	2.100	2.011	1.012	0.933	0.800	1.631
	Giza 674	4.567	4.000	2.621	1.712	1.500	0.567	2.494
	Giza 716	4.533	1.333	2.321	1.989	1.667	0.367	2.035
	Giza 843	10.233	8.967	3.981	1.991	2.433	0.700	4.717
L.S.D.	0.05	2.698	1.462	1.390	1.410	1.271	0.732	2.095
	0.01	3,663	1.986	1.887	1.914	1.727	0.987	2.747

seasons , the application of 60 kg P20 5 with each of G. 461 and G.716 gave the best combination to reduce number of aphids in late planting date.

C- The *number* of larvae and pupae of leaf miner of

The number of larvae and pupae of leaf miner on faba bean plants were recorded start in 25/ 11 and 14/12 in the early plantin g date and 23/12 and 22/1 in the late plantin g date in the first and second season, respectivel y.

Effect of phosphorous fertilizer levels

The number of larvae and pupae /10 leaves of leaf miner as affected by phosphorous in both seasons in tw o planting dates are presented in Tables (14 and 15) •In the first season, significant numbers of larvae and pupae of leaf miner were detected in 25/11 in the first planting date. In this sample, the numbers of larvae and pupae of leaf miner were decreased by increasing phosphorous fertilizer up to 60kg P20 5 / fed. Also, average numbers of larvae and pupae of leaf miner over all weekly samples were significantl y decreased b y increasing P-*levels* up to 60kg $p_2 o_5$ / fed . in late planting date. The number of larvae and pupae /10 leaves were 6.07,5.572 and 5.61 in late planting at zero , 30 and 60 *kg* $p_2 0_5$ / fed respectively. Also, the average number of larvae and pupae /10 leaves were hi gher in early planting date com pared with late planting date in the same

samples. In the second season , the numbers of larvae and pupae / 10 leaves of leaf miner on faba bean were significantly decreased by increasing phosphorous fertilizer up to 60kg P_2O_5 / fed .on samples taken in 15/1, 22/1, 29/1 , 7/2 , 5/3 and 12/3 in early planting date and 19/2 in late planting date . Also, the number of larvae and pupae /10 leaves increased gradually from early samples to late one in both planting dates. The average number of larvae and pupae over weekly samples in both planting dates were significantly decreased by increasing phosphorous fertilizer up to 60kg P_2O_5 /fed the number of larvae and pupae /10 leaves were 14.02, 13.23 and **11.11** in the first planting date ,and 11.39, 11.42 and 10.25 in late planting date at zero,30 and 60 kg P_2O5 /fed, respectively. While, the number of larvae and pupae / 10 leaves were high in early planting date compared to the late planting date in the same sample.

2- Varietal performance:-

The average values of larvae and pupae leaf miner /10 leaves as affected by varieties in both planting dates and both seasons are presented in Tables (16 and 17). Results showed that the differences between varieties in the first season were significant for number of larvae and pupae of leaf miner /10 leaves in samples of 25/11 and 24/2 of leaf miner /10 leaves in

early and late planting dates respectively as well as over weekly samples in both planting dates.

The first season:

In the first sample 25/11 in the early planting date (Table 16) G.843 gave the lowest number of larvae and pupae of leaf miner followed by G.716, 25/11. However , G.3 gave the highest one.

In the late planting date , in 24/2 sample , G. 716 followed G. 461 and then G 843 gave the lowest values of number of larvae and pupae of leaf miner. However, G.674 gave the highest one. Average over all samples in early planting date, G.716 followed G.674 had the lowest number of larvae and pupae /10 leaves of leaf miner . While, G716 followed by G.843 showed the lowest number of larvae and pupae /10 leaves in leaf miner in late planting date. However, G.3 gave the highest one in both planting dates.

The second season: The results in Table (17) revealed that the differences between 'varieties were significant for number of larvae and pupae /10 leaves of leaf miner in all samples in both planting dates as well as the average over samples except samples in 14/12, 25/12, 1/1, 9/1 and 5/3 in early planting date and in 29/1 in lath planting date. The lowest number of larvae and pupae /10 leaves of leaf miner in early planting date were

obtained by G. 843, G.843, G. 674 G. 716 , G.716 and G.3 in weekly samples 15/1 , 22/1, 29/1, -7/2, 19/2, and 12/3, respectively . While, in late planting date, G. 461, G. 843 G. 716 and G.843 gave the lowest average values of number of larvae and pupae /10 leaves of leaf miner in samples in 7/2, 19/2, 5/3, and 12/3 respectively.

G.3 followed G.716 gave the lowest average number of larvae and pupae /10 leaves of leaf miner on faba bean over all samples in early planting date. Also, both cultivars G.716 and G.843 gave the lowest average number of larvae and pupae of leaf miner in late planting date. Also, over two seasons and two planting dates, G. 716 gave the lowest number of larvae and pupae /10 leaves.

It could be concluded that two varieties G. 716 and G843 were considered the best variety for infestation of leaf miner (larvae and pupae).

Generally, the second season , gave the highest infestation by larvae and pupae than the first one. Also high numbers of larvae and pupae in early planting date compared to late planting one.

These results are in harmony with those obtained by **Abdallah** *et al* **(1996 a & b)** as well as **Bastwisy** *et al* **(1998)**

3- Effect of interaction between varieties and phosphorous fertilizer levels.

The effect of interaction between varieties and phosphorous fertilizer levels on number of larvae and pupae of leaf miner in separate planting date in both seasons are presented in Tables (18,19, 20 and 21) .

Data in Table (18) indicated that phosphorous fertilizer levels and variety interaction in the first season and early planting date in each weekly samples as well as the average over them showed a significant effect at samples in 9/1, 16/1, 24/2, 3/3, and 17/3, as well as the average over all samples . However, the rest weekly samples were insignificant effect.

The application of 60kg P_2O_5 with each of G.3 and G. 716 and 30kg $P20_5$ with G.674 in the sample at 9/1 and control phosphorous (0.0) with each of G.3 and G. 716 and 30kg P_2O_5 with G. 716 on sample in 16/1 and 30kg $P20_5$ with each of G. 674 and G.716 on sample at 24/2 and control phosphorous (0.0) with each of G. 716 and G. 843 , 30kg $P20_5$ with G.3 and 60kg P205 with G. 843 on sample at 3/3 and control (0.0) $P20_5$ with each of G.3, G. 461 and G. 716, 30kg $P20_5$ with each of G. 716 and G. 843 and 60 kg $P20_5$ with G. 461 on sample at 17/3 gave the lowest number larvae and pupae of leaf miner /10 leaves in early planting date.

The application of (0.0) P_2O_5 with G. 716 in the average of all samples gave the lowest value of number of larvae and pupae . With the exception of G.3 and 30 kg P_2O_5 the other interaction effect gave similar effect at 0.05 level of probability.

Data in Table (19) revealed that phosphorous fertilizer levels and variety interaction effect in the second season and early planting date in weekly samples as well as the average over them showed a significant effect except weekly samples at 25/12, 1/land 9/1 .

The application of 60kg P_2O_5 /fed with G.716 samples 14/12, 29/1, and 7/2; 30kg P_2O_5 /fed with G. 674 on samples at 15/1 and 22/1; 60 kg P205 /fed with G.461 at sample in 19/2 , 0.0 P_2O_5 with G.3 on sample in 5/3; and 60kg P_2O_5 /fed with G.3 on sample in 17/3 gave the lowest number of larvae and pupae of leaf miner /10 leaves in early planting date in the second season.

In the average of all weekly samples the effect of interaction between 60 kg $P_2$05 with G. 716 followed by G.3 gave the lowest value of number of larvae and pupae of leaf miner. It could be concluded that G.3 followed by G. 716 were the best varieties for decreased number of larvae and pupae in early planting date in both seasons when received by 60 kg P_2O_5 /fed.

Data in Table (20) showed that insignificant effect of phosphorous fertilizer and variety interaction in the first season at late planting date in weekly samples . However, significant interaction effect was 3ignificant for infestation by leaf miner number of larvae and pupae /10 leaves over all weekly samples.

The application of 30 kg P_2O_5 / fed. with G. 843 and 60 kg P_2O_5 /fed with G. 716 gave the lowest number of larvae and pupae /10 leaves over all weekly samples.

Data in Table (21) showed significant effects of phosphorous fertilizer and variety interaction at late planting date in the second season on the weekly samples as well as the average over them except first samples 29/1.

The application of 30kg $P20_5$ /fed with G.461 in 7/2 , 30 kg P_2O_5 /fed G. 716 in 5/3 , 60 kg P_2O_5 /fed with G .3 in 19/2; 60kg P_2O_5 with G. 843 in 12/3 gave the lowest number of larvae and pupae /10 leaves .

The application of 60 kg P_2O_5 /fed with G.843 followed by G. 716 gave the minimum number of larvae and pupae / 10 leaves in the average of weekly samples.

P2o5 kg/fed.	25/11	2/12	23/12	1/1	9/1	16/1	7/2	13/2	24/2	3/3	17/3	Average
	Early planting date											
0	OZZZ	08Z'S	LZTV	008 4	C52 5	L91	£695	LOS L	1L'1L	8O	O Tr co	[illegible]
30 kg/fed.	a0 Z	OZL:17	017Z12	008 17	09Z'S	O8E5	£69 5	0808	EL6 9	8O rq	O 00	co tri
60 kg/fed.	090	088'17	£L£'17	£££8 17	L86 17	C19s:	0Z9 O	E 009	LK/L	cO	O co or;	to wi
C04	CZ0 O	SN	SN	SN	SN	SN	NS	NS	NS		reo	
100	H 0.0							.	.	1	.	.
			Late planting date									
00	-	-	-	.			LOTS	LZL*17	EE1 9	rO8	rn m m	O: 6
30 kg/fed.	-	-	-	-		.	L8Z 0	£1S t	OK'S	m m M	O 4- n	ct ri
60 kg/fed.	-	-	-	-			E£CC	L91 7	£5L'	m r	O t vg	O I ..;
0.OS	-	-	-	-		.	NS	NS	SN		oo N	O M o
0.01	-	-	-	-		.		.	.	.		O M

Sampling dates P2o5kg/fed.	14/12	25/12	[illegible]	[illegible]	[illegible]	7/2	19/2	5/3	12/3	Average
Early planting date										
0	3.45	3.27	4.158	4.47	6.026	7.722	9.29	12.656	27.13	68.39	14.02
30 kg/fed.	3.48	3.406	3.962	4.84	6.01	7.086	10.01	12.714	33.41	58.40	13.2j
60 kg/fed.	2.84	3.18	3.22	3.696	4.622	6.73	[illegible]	11.686	29.87	46.95	11.42
L.S.D. 0.05	NS	NS	NS	NS	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L.S.D. 0.01	-	-	-	-	2.321	2.39	2.192	3.383	-	-	4.10	1.41
Late planting date										
0	-	-	-	-	-	7.02	18.65	27.21	[illegible]	[illegible]	11.39
30 kg/fed.	-	-	-	-	-	1.568	2.14	7.46	18.51	27.48	11.42
60 kg/fed.	-	-	-	-	-	1.560	2.40	5.95	16.63	24.75	10.25
L.S.D. 0.05	-	-	-	-	-	NS	NS	0.46	NS	NS	1.116
L.S.D. 0.01	-	-	-	-	-	-	-	0.77	-	-	1.64

pho ...st planting ... e second season (1999/2000). ...cted by varieties

Samples date		14/12	25/12	1/1	9/1	15/1	22/1	29/1	7/2	19/2	5/3	12/3	Average
P.	cvs												
0.0	G.3	2.730	3.730	4.620	6.510	7.830	7.900	8.600	13.200	22.470	53.030	12.150	5.990
	G.461	3.220	4.980	4.900	7.010	8.230	7.890	10.270	12.120	24.400	78.370	15 060	5.590
	G.674	3.330	3.990	4.210	6.990	8.700	7.110	6.800	11.980	25.470	69.770	13.820	5.600
	G.716	3.500	4.100	4.310	5.010	7.930	7.810	7.930	12.310	35.930	54.270	13.300	5.460
	G.843	3.500	3.990	4.310	4.610	5.130	8.900	12.810	13.670	27.370	86.500	15.770	5.700
30	G.3	3.600	3.600	4.710	6.410	9.660	7.300	12.000	14.100	35.900	29.830	11.860	6.130
	G.461	2.130	2.960	3.620	5.210	6.370	7.010	7.460	11.980	34.500	82.030	15.060	5.910
	G.674	2.130	3.210	3.680	3.600	3.530	6.210	9.500	12.100	35.930	50.600	12.120	5.490
	G.716	1.760	3.810	3.910	4.860	5.770	7.110	8.800	11.890	33.130	66.070	13.770	5.570
	G.843	2.760	3.450	3.890	4.120	4.730	7.800	12.300	13.500	27.600	63.470	13.360	5.680
	G.3	4.030	3.900	4.120	6.020	9.800	5.210	4.700	12.110	30.200	28.600	10.190	5.950
60	G.461	2.430	3.200	3.410	4.980	6.930	7.110	9.400	10.210	26.200	53.370	11.850	5.920
	G.674	3.200	3.200	3.610	3.700	5.330	6.010	7.640	10.910	29.730	54.330	11.860	5.570
	G.716	3.070	3.100	3.720	4.310	5.200	5.100	3.930	11.600	25.230	45.030	10.120	5.610
	G.843	3.170	3.210	3.620	4.100	6.400	6.800	9.090	13.600	37.970	53.400	13.090	5.540
LSD	0.05	0.740	N	NS	NS	1.71○	1.620	1.710	1.630	2.131	7.060	7.020	2.460
	0.01	1.020	-	-	-	2.3ZZ	2.120	2.: ZZ	2.210	2.893	9.510	9.540	3.230

Table (20): Average number of larvae and pupae of leaf miner on faba bean as affected by varieties phosphorus interaction in the late planting date during the first season (1998/1999).

Samples date		7/2	13/2	24/2	3/3	17/3	Average
P.	cvs						
	G.3	5.000	5.433	7.300	8.067	9.633	7.080
	G.461	5.100	5.167	5.500.	8.167	7.633	6.320
0.0	G.674	5.333	4.533	6.633	6.533	5.667	5.730
	G.716	5.100	3.733	5.633	5.867	5.867	5.230
	G.843	5.000	4.767	5.600	5.400	7.867	5.720
30	G.3	5.200	4.433	5.833	6.400	4.867	5.340
	G.461	5.100	4.200	5.067	5.600	7.500	5.480
	G.674	5.200	5.533	6.633	7.967	5.733	6.200
	G.716	5.300	4.300	4.633	6.067	6.500	5.360
	G.843	5.633	4.100	4.533	5.633	4.100	4,790
00	G.3	5.300	4.300	6.167	6.333	5.167	5.450
	G.461	5.433	4.833	5.067	6.400	5.533	5.450
	0.674	5.300	4.400	6.400	6.300	4.967	5.470
	6.716	5.300	4.067	5.067	6.300	4.000	4.940
	0.843	5.333	4.733	6.067	5.533	8.533	6.020
LSD.	0.05	NS	NS	NS	NS	NS	1.050
	0.01	-	-				1.038

Table (21): Average number of larvae and pupae of leaf miner on faba bean as affected by varieties phosphorus interaction in the second planting date during the Second season (1999/2000).

Samples date		29/1	7/2	19/2	5/3	12/3	Average
P.	cvs						
0.0	G.3	1.410	:3.467	8.500	16.333	31.767	12.290
	G.461	2.010	:3.033	6.600	25.100	21.267	11.600
	G.674	1.600	2.600	6.700	15.100	32.433	11.680
	0.716	1.310	2.133	7.733	17.700	23.633	10.490
	G.843	1.200	:1.733	5.567	19.033	26.967	10.890
30	G.3	1.700	2.700	7.233	25.300	27.000	12.780
	G.461	0.600	0.833	8.633	16.833	27.300	'10.830
	G.674	2.100	3.500	7.900	16.633	31.733	12.370
	G.716	1.830	1.933	7.200	12.767	25.100	9.760
	0.843	1.610	- 1.733	6.333	21.000	26.267	11.380
60	G.3	1.920	2.867	2.667	15.467	33.433	11.270
	G.461	1.100	1.267	6.600	14.900	32.433	11.260
	G.674	1.670	2.533	8.400	25.800	18.430	11.360
	0.7 I 6	1.100	2.300	5.900	13.200	26.133	9.720
	G.843	2.010	3.033	6.167	13.800	13.330	7.660
LSD.	0.05	NS	0.705	0.968	4.532	6.360	3.190
	0.01	-	0.956	1 321	6.171	8.610	4.194

It could be concluded that both varieties G. 843 and G.716 when received by 60 kg P_2O_5 / fed. were considered the excellent cvs. for lower number of larvae and pupae of leaf miner in faba been under study. Generally the two cultivars were considered the best for lower the number leaf miner in late planting date.

D- The infestation percentage of leaf miner

The infestation percentages of leaf miner on faba bean plants were recorded start in 25/11 and 14/12 in the first planting date (early planting date) in the first and second seasons respectively and 7/2 in the late planting date in both seasons

1-Effect of phosphorous fertilizer levels:-

The infestation of percentage of leaf miner as affected by phosphorous in both -seasons in the two planting dates are presented in Tables (22 and 23) . In the first planting date (early planting) the infestation percentage of leaf miner was significantly differences between effect of phosphorous fertilizer in all weekly samples in both seasons except samples 16/1 and 13/2 in the first season . In all weekly samples the infestation percentage of leaf miner was decreased significantly by increasing P-levels up to 60 kg $p_2 0_5$ fed. Also the average over all weekly samples infestation percentage of leaf miner was decreased by increasing P- fertilizer up to 60 kg P_2O_5 /fed. The

percentage infestation was 21.202% and 11. 59% by 60kg $p_2 0_5$ / fed . in the first and second seasons respectively .However, the infestation percentages of leaf miner were 25. 045 and 15.98% under zero p- levels in the first and second season, respectively.

In the second planting date (late planting date) infestation percentages of leaf miner were significantly different by the phosphorous effect in the second season and in 13/2,3/3 and 17/3 in the first season. The same trend was obtained in late planting date as shown in the early planting date. The infestation percentages of leaf miner were decreased by increasing P-levels up to 60kg $P20_5$ /fed. in both seasons . Also, the average infestation percentages of leaf miner over all weekly samples in late planting date were significantly decreased by increasing phosphorous fertilizer up to 60kg p2o5/fed. The range of infestation of leaf miner average over five samples in the late planting date were from 7.913 to 6.714 in the first season and from 10.757 to 8.072% in the second season. These result might be due to different temperature and other climatic conditions in both seasons (Table 1) Generally , the infestation percentages of leaf miner were decreased in late planting date . These results might be due to low temperature °C in late planting date which was affected the growth and spread of leaf miner. The effect of P- application on the infestation percentages of leaf miner could

However, the highest values of infestation % of leaf miner were detected by G.3, G.843, G.843, G.716, G.716, and G.674 in the some order.

In late planting date, the lowest values of infestation % of leaf miner were obtained by G.716,G.3, G.674 and G.3 on samples in 7/2, 19/2 , 5/3 and 12/3 respectively . However G.843, G.461, G.461, G.674 and G.461 gave the highest infestation % of leaf miner in the same order.

The lowest values of infestation % of leaf miner average over the different samples were obtained by G.461 followed by G.3 in the first planting date and 0.674 followed by G.461 in the late planting date in the second season. while, G.461 gave the lowest infestation percentage of leaf miner in both planting dates in the second season . It could be concluded that the G. 461 was considered the best variety for low infestation % of leaf miner.

3-Effect of interaction between varieties and phosphorous fertilizer levels .

The effect of interaction between varieties and P. fertilizer on infestation percentages of leaf miner in weekly samples as well as average over them in both planting dates in both seasons are presented in Tables (26, 27, 28 and 29). Data in Table (26) revealed that significant effects of phosphorous fertilizer and

varieties in all weekly samples as well as average in the first season at early planting date except samples 2/12, 23/12 and 24/2.

The application of 30kg P2 05 / fed with each of G. 461 on samples 25/11 and 17/3 and G. 716 on samplel/1; 60 kgp$_{2}$0$_{5}$ with each of G.843 on samples 9/1 and 16/1 ; G.461 on samples 26/1 and 2/2 , and G.674 on sample 3/3 gave the lowest infestation percentages .

Averages infestation percentages of leaf miner over weekly samples showed that the lowest infestation was detected by G.461 when received 30 and G3 60 kg P20$_{5}$ / fed but without significant superiority over G.716 and G.46I when received by 60 kg p$_{2}$ o$_{5}$ /fed.

Data in Table (27) revealed that phosphorous fertilizer and variety interaction in the second season in early planting date in weekly samples as well as average showed a significant effects except samples 25/12, 9/1, 15/1 , 22/1 and 29/1. The application of 30kg p$_{2}$ O$_{5}$ / fed with each of G. 843 on sample 1/1 and G.461 a sample 7/2 , 60kg p$_{2}$ 0$_{5}$ / fed with each of G.3 on samples 19/2 , 5/3 and G. 716 on sample 12/3 gave the lowest infestation percentage of leaf miner .

In the average overall weekly samples , the application of 60kg P_2O_5 with G.461 gave the lowest infestation percentage of leaf miner followed by G. 716 and G.3

It could be concluded that G.461 followed by G.716 were considered the excellent varieties for decreasing the infestation percentage of leaf miner in early planting date when received 60 kg p2 05 / fed

Data in Table (28) revealed that phosphorous fertilizer and variety interaction in the first season at late planting date as well as the average over weekly samples, showed a significal effects for all samples. The application of 30kg p2 05 / fed with each of G.674 on sample 13/2 ,G.843 on sample 17/3; 60 Kg p2 05 / fed with each of G.3 on sample 17/3 and G.843 on sample 3/3 and G.843 and G.3 with 0,0 P_2O_5 at samples?/2 and 24/2 respectively gave the lowest percentage of infestation of leaf miner . G. 843 followed by G.674 when received by 60 kg p205/ fed gave the lowest infestation percentage of leaf miner over all weekly samples .

Data in Table (29) showed a significant effect between phosphorous fertilizer and varieties for infestation percentage of leaf miner in all weekly samples during the second season at late planting date except sample in 7/2. The infestation ranged from

					140	21.22	20.867			
					060	19.333	20.867			
.753	55.533	17.267	14.753	17.293	17.287	17.933	18.633	18.993	17.133	12.667
2.65	3.601	2.79	2.74	1.37	NS	1.81	NS	2.0	0.78	0.99
4.40	5.98	4.65	4.55	2.26	-	2.99	-	3.31	1.70	1.98
Late planting date										
-	-	-	-	-	-	5.907	8.32	7.373	9.273	8.693
-	-	-	-	-	-	5.873	7.42	7.527	7.82	6.807
-										

I 22/1 I 29/1 7/2 19/2 I 5/3 I 12/3 I Average

11.067

by phosphorous x varieties (9).

Samples date		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Average
	[illegible]												
[illegible]	[illegible]	[illegible]	[illegible]	22.367	[illegible]	[illegible]	19.133	[illegible]	[illegible]	[illegible]	25.867	[illegible]	24.087
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	69.333	[illegible]	[illegible]	[illegible]	16.833	[illegible]	[illegible]	22.467	16.433	[illegible]	24.578
	[illegible]	[illegible]		[illegible]		26.233	23.133	[illegible]	[illegible]	[illegible]	[illegible]	12.133	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22.433	21.833	[illegible]	[illegible]	[illegible]	[illegible]	25.518
[illegible]							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21.167	23.548
	[illegible]	21.167	[illegible]	21.233	[illegible]	[illegible]	[illegible]	[illegible]	21.367	[illegible]	14.533	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20.033	21.433	[illegible]	[illegible]	14.533	24.142
	[illegible]	25.633	49.833	15.733	[illegible]	[illegible]	[illegible]	[illegible]	19.333	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	33.633	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.433	[illegible]	21.433	[illegible]	[illegible]	24.235
[illegible]		22.033	[illegible]	[illegible]	[illegible]	[illegible]	17.733	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	48.733	21.433	[illegible]	[illegible]	[illegible]	15.933	15.833	[illegible]	19.533	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19.833	[illegible]	[illegible]	22.339
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17.633	[illegible]	[illegible]	18.133	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	24.333	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.367	[illegible]	21.636
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

Table (28): Average number of larvae and pupae of leaf miner on faba bean as affected by varieties x phosphorus interaction in the late planting date during the first season (98/1999).

Samples (.1a:e.							
cvs	A- Late lanti		13/2		3/3	17/3	Average
M	na. 4.467		jiglale				
	Ci.461		7.400		10.067	8.900	7.06
	G.674	6.533	7.067		9.833	7.764	7.733
	G.716	4.133	10.30	7.933	8.667	10.367	8.76
	G.843	9.033	6.300	6.733	8.800	7.300	6.653
	511.11111=111		10.533	9.100	9.000	9.133	9.359
30	G.461	5.967	8 367	9.00		7.633	7.813
	G.674	4.867	7.567	7.767		6.233	7.213
	G.716	5.800	.5.767	7.000		7.333	6.500
	G.843	5.800	9.133	7.833	8.667	7.767	7.84
	G.3	6.767	6.267	6.033		o	6.08
60	G.461	6.567	.033	9.067	7.933	5.067	6.973
	G.674	5.467	7.167	7.500	8.133	8.067	7.486
	G.716	5.900	5.800	6.600	8.267	5.633	6.353
	G.843	6.567	5.900	6.833		6.067	6.486
	0.05		5.933	5.267	6.833	6.767	6.273
L. S. D.		1.21	2.121	1.64	2.341	2.641	1.275
	0.01	1.64	2.374	2.23	3.172	2.797	1.671

Table (29): Average values of larvae and pupae of leaf miner as affected by varieties x phosphorus interaction during the second season (1999/2000).

	Samples date	29/1	7/2	19/2	5/3	12/3	Average
P.	cvs	Late planting date					
0.0	G.3	5.01	11.8	11.23	25.73	3.77	11.508
	G.461	2.85	3.83	10.43	24.87	5.30	9.456
	G.674	4.21	5.40	9.20	22.33	7.87	9.802
	G.716	3.24	4.67	11.13	18.63	10.57	9.648
	G.843	6.21	10.23	13.97	27.57	8.87	13.37
30	G.3	4.02	9.73	6.83	19.57	5.47	9.124
	G.461	2.67	4.93	9.80	17.90	6.73	8.406
	G.674	4.89	6.63	9.83	18.97	3.37	8.738
	G.716	2.47	3.47	12.33	28.47	10.20	11.388
	G.843	4.62	5.70	11.60	25.40	7.47	10.958
60	G.3	4.32	6.57	6.30	17.73	5.40	8.064
	0.461	3.96	5.97	8.53	19.30	5.63	8.678
	G.674	1.99	2.81	10.43	15.17	4.07	6.892
	G.7I6	2.25	3.10	7.20	18.37	5.54	7.292
	G.843	3.60	4.8	9.37	24.37	5.03	9.434
L. S. D. 0.05		NS	1.52	2.04	4.98	1.64	1.76
L. S. D. 0.01		-	2.07	2.98	5.12	2.24	2.307

Table (29a) the relationship between plant height and each of average of aphids number, percentage infestation of leaf miner and no. of larvae and u ae of leaf miner.

Season	Planting date	Aphids	L. M. %	No. of L. M.
1998/99	DI	-0.598*	-0.129	0.408**
	D2	-0.012	-0.205	0.20
1999/2000	D1	0.606*	--0.44	0.209
	D2	-0.363	-0.237	0.522*

* and **significant at 0.05 and 0.01 levels of probability, respectively.

1.99 (60 Kg P_2O_5 and G.674 in sample 7/2) to 27.57% (G. 843 and zero fertilizer) in sample in 3/3.

The application of 60 Kg P_2O_5/ fed, with each of G.674 on samples in 13/2 ,3/3,17/3 and average Over weekly samples and G.716 in sample in 13/2 gave the lo west infestation percentage of leaf miner. Also G. 674 followed b y G.716 and then by G.3 gave the lowest infestation percentage of leaf miner when received by 60 P_2O_5/fed. Also, these combinations we re considered the best treatment for decreasing the infestation percentage of leaf miner in both planting dates.

The simple correlation coefficient between averages of plant height and each of number of aphids, percent infestation of leaf miner and no. of larvae and pupae of leaf miner were calculated in each planting date in both seasons (table 29a).

(29 a) shows significant ne gative phenotypic correlation values were fond between plant height and number of aphids in early planting dates in both seasons. This result indicates the high number of aphids associ ated with short plant height. On the other hand, insignifican t correlation coefficient values were detected between two variables in l ateplanting date in both seasons, indicating, that plant height had no effect on number of aphids/ plant.

Table (29 a) shows insignificant phenotypic correlation values were detected between plant height and percentage infestation of leaf miner in both planting dates in both seasons. This result indicates that plant height had no effect on percent of infestation of leaf miner.

Table (29 a) shows significant positive correlation coefficient values between plant height and number of larvae and pupae of leaf miner in early planting date in the first season and late planting date, in the second season. This result indicates that increasing plant height increased no of larvae and pupae. On the other hand insignificant correlation coefficient values were obtained between two variables, in early planting date in the second season and late planting in the first season, indicating that plant height had no effect on number of larvae and pupae of leaf miner. The contradiction of correlation values is logic, whereas the performance varieties charged from date to other.

Relation between anatomy of P-fertilizer levels and Aphids infestation :-

Aphids are polyphagous pests, feeding on the plant sap. Some host species verities are usually known to be preferred to infestation with aphids than others. Leaf anatomic characters play an important role in insect behavior. Also, the effect of P-

fertilizer on anatomic characters play an important role in *insect* infestation.

Data in Table (30) show an increase in cuticle (upper and lower), epidermis (upper and lower) and decreased in palisade and spongy tissue in micron and number of spongy layer by increasing P-fertilizer from o.o to 60kg $p_2 0_{5./}$ fed. The Aphid infestation decreased by increasing p- fertilizer levels (Table 30).

Relationship between anatomy of faba bean variety leaves and Aphids infestation:-

Some host varieties are usually known to be preferred to infestation with aphids than others. Leaf anatomic traits play an important role in insect behavior

Data in Table (31) showed the relation between these traits and aphids infestation for five faba bean varieties in both planting dates during the second season. Cuticle and epidermis (upper and lower), palisade tissue and spongy tissue in micron and number of spongy layer were measured in the leaves of the five varieties in both planting dates.

Data in **Table** (31) showed the relation between anatomic traits of leaf and the average aphids population on plant.

Giza 674 c.v. which had cuticle and epidermis (upper and lower) and spongy tissue layer thicker and palisade tissue layer thinner than the other cvs . The mean number of aphids was

lower on Giza 674 c.v. (14.35 in early planting and 2.93 in late one) than other cvs . However, the two varieties G. 716 and Giza 843 gave the opposite the thinner cuticle and epidermis (upper and lower) and thickness of palisade tissue than other cvs. The mean number of aphids was higher in both varieties than other in both planting dates. (Table 31).

Similar result was obtained by **Shalaby (1998).**

Relationship between combination of faba bean cvs. and P-fertilizer levels and aphid *(Aphis craccivora)* **infestation:**

Data in Tables (32 and 33) and figs (2-6) showed the relation between leaf anatomic traits and aphids infestation for combination between faba bean cvs and P-fertilizer In some cases, thickness of upper epidermis had low no. of aphids infestation, for example Giza 674 when received 60 kg $p_2 0_5$ / fed. in the first planting'date. While. Giza 461 when received 60 kg $p_2 O_5$ which had the lower palisade tissue in micron (81) resulted in a decrease in mean no. of aphids. Insignificant negative correlation between mean no. of aphids and each of cuticle was detected and significant negative correlation coefficient between mean number of aphids and upper epidermis was obtained. This result indicates the effect of thickness for these anatomic traits for reducing number of aphid, especially the upper epidermis. On the other hand, significant positive

correlation coefficient between aphids population and palisade tissue in both planting dates was obtained, indicating that thinner of palisade tissue resulted in the lower no. of aphids.

Relationship between leaf anatomy of P- fertilizer levels and leaf miner infestation:-

Data in Table (:30) showed that an increase in the cuticle and epidermis (upper and lower) and spongy tissue and no. of spongy tissue by rising the amount of P- fertilizer from 0.0 to 60 kg P_2O_5 / fed. resulted in lower leaf miner populations.

Relationship between anatomy of bean variety leaves and leaf miner infestation:-

Data in Table (30) showed the relation between leaf anatomic traits and leaf miner infestation for five faba bean varieties in both planting dates during the second season.

Data in Table (31) showed the relation anatomic traits of leaf in the five faba bean varieties and the average number of leaf miner on the leaf.

Generally, in both planting dates, the result showed that decreasing spongy tissue in micron decreased the number of leaf miner/plant. G.716 cv. Which had thinner spongy tissue than the other CVs. The mean number of larvae and pupae of leaf miner were lower on Giza 716 CV. (11.15) in planting dates. The decrease in the number-of larvae and pupae of leaf miner / plant

may be due to thinner palisade tissue (G .3 in early planting date) .

Relationship between combination of faba bean CVs. and p-fertilizer levels and no. of leaf miner infestation

Data in Tables (32 and 33) and figs (2-6) showed the relationship between leaf anatomic traits and leaf miner infestation for Interaction between faba bean CVs. and p-fertilizer.

In generally, thinner of palisade tissue in micron had low number of larvae and pupae leaf miner. G.3 and G.674 when received 30 kg P_2O_5 / fed in the fist planting date and G.461 and G.716 when received by 30 and 60 kgp_2 o_5 / fed ., respectively had the lower (thinner palsied tissue in micron), resulted in a decrease in mean number of leaf miner . Also , in some cases thickness of cuticle and epidermis in micron (upper and lower) had low number of leaf miner such as G. 674 by 30 kg $_{P2}$ 0_5 / G.461 by 60 kg p2 0_5 / fed in both planting dates. Insignificant negative and high values of correlation coefficient between mean no. of larvae and pupae of leaf miner and each of cuticle and epidermis (upper and lower) was obtained in bath planting dates . This result indicate the effect of thickness for these anatomic traits for reducing number of larvae and pupae of leaf miner. On the other hand , significant positive correlation

Table (30): Anatomy leaf traits and relation between these traits of leaves affected by P. fertilizer and each of aphids and leaf miner infestation in both planting dates in the second season.

P205 Kg/fed.	Cuticle (micron)		Epidermis in micron		Palisade tissue in micron	Spongy tissue in micron	No. of spongy layer	Average no. of Aphids /10 leaves	Average no. of leaf miner/10 leaves
	Upper	Lower	Upper	Lower					
Early planting date									
0.0	6.84	5.22	38.16	32.94	115.38	238.5	4.5	18.76	14.09
30kg/fed	7.74	5.94	44.52	29.07	103.68	229.68	4.2	16.47	13.23
60kg/fed	7.92	6.39	49.86	33.75	91.29	180	3.9	12.92	12.42
Late planting date									
0.0	6.84	5.58	34.4[7]	25.92	111.31	223.2	4.1	4.63	11.39
30 kg/fed	6.84	6.12	38.79	30.64	120.06	216.27	3.8	3.49	11.42
60kg/fed	7.2	5.4	40.6	32.39	95.97	183.42	4.12	2.65	10.318

Table (31): Anatomy leaf traits and relationship between these traits of faba bean cvs. leaves and each of aphids and leaf miner infestation in both planting dates in the second season.

Variety	Cuticle (micron)		Epidermis in micron		Palisade tissue in micron	Spongy tissue in micron	No. of spongy layer	Average no of Aphids /101eaves	Average no of LM/10 leaves
	Upper	Lower	Upper	Lower					
Early planting date									
0.3	7.2	5.4	39.86	29.7	100.5	255	4.7	16.51	11.52
G.461	9.5	6	44.4	30.3	94.72	194.4	4.33	15.15	13.99
G.674	8.1	7.33	59.1	36.9	89.4	241.7	4.0	14.35	13.47
G.716	6.3	5.4	33.97	28.05	99.38	134.7	17.7	17.59	12.39
G.843	6.3	5.1	34.33	29.85	129.0	227.4	4.3	16.15	14.07
Late planting date									
G.3	6.3	5.1	33.9	33.17	105.55	284.53	3 83	2.51	12.11
G.461	7.5	6.3	40.95	33.25	89.5	181.77	183	3.18	11.23
G.674	7.65	6.6	42.9	30.61	95.05	237	4.0	2.93	11.89
G.716	6.3	5.4	36.75	26.4	125.2	169.8	4.0	3.79	9.99
G.843	6.3	5.1	33.6	23.83	129.96	20+.3	4.3	5.54	9.97

Table (32): Anatomy leaf traits and relationship between these traits of faba bean phosphorous x varieties interaction and each of aphids and leaf miner infestation in early planting date.

Traits		Cuticle in micron		Epidermis in micron		Palisade tissue in micron	Spongy tissue in micron	No. of spongy layer	No. of Aphids/ 10 leaves	No of LM/10 leaves
P.	Cvs	Upper	Lower	Upper	Lower					
0.0	G.3	7.2	4.5	36.9	35.1	101.7	315	5	18.24	12.5
	G.461	7.2	5.4	' 36	30.6	94.05	238.5	4.5	20.11	15.06
	G.674	7.2	6.3	54.9	41.4	103.5	276.3	5	14.53	13.82
	G.716	6.3	5.4	31.5	28.8	130.5	124.2	3	24.00	13.3
	0.843	6.3	4.5	31.5	28.8	147.15	238.5	5	16.91	15.77
30	G.3	7.2	5.4	43.2	26.1	94.5	251.1	5	15.26	11.86
	0.461	9.0	6.3	51.3	31.5	81	165.6	4	12.85	15.06
	G.674	9.0	7.2	55.8	38.7	82.8	274.5	4	16.34	12.12
	G.716	6.3	5.4	34.2	21.6	116.55	147.6	4	18.31	13.77
	G.843	7.2	5.4	35.1	27.45	143.55	228.6	4	19.58	13.36
60	G.3	7.2	6.3	39.5	27.9	105.3	198.9	4	16.04	10.19
	G.461	12.6	6.3	45.9	28.8	91.8	179.1	4.5	12.48	11.85
	G.674	8.1	8.5	66.6	50.4	81.9	174.3	.3	12.17	11.86
	G.716	6.3	5.4	36.3	27.9	81.0	132.3	4	10.47	10.12
	G.843	5.4	5.4	36.4	33.3	96.3	215.1	4	11.96	13.09
r.Aph		-0.22	-0.39	-0.50*	-0.32	0.64**	0.10	-0.08		
r.L.M.		-0.14	-0.32	-0.18	-0.06	0.42*	0..16	0.23		

* and **cian;fin.,+ ...l- n nc and n A1 levels o probability, respectively.

of aphids. In the first planting date, G. 674 gave the lowest number of aphids while, it contained high level of crude protein (12. 58) and the lowest soluble sugars (13.52) in leaves in flowering date. This result indicates the increasing crude protein and lower soluble sugar decreased number of aphids infestation on the other extreme the higher containing sugars and lower containing crude protein varieties (G. 716 and G.3) attracted the highest average number of aphids. As for the second planting date the two cultivars G.3 and G. 674 were found harbouring the lowest number of aphids associating with high crude protein and low soluble sugars % (Table 35).

The previous results leaf to the speculation that the plant phytochemical components in amount from variety to another and also according to planting date and this may be reflection plant infestation by insect pests within it aphids.

These result are in harmony with these obtained by **Shalaby (1998)**

Effect of interaction between varieties and phosphorous fertilizer levels

The effect of interaction between varieties and phosphorous fertilizer levels on phytochemical components crude protein, soluble sugars % (reducing, non reducing and

total %) and aphid infestation in both planting dates are presented in Tables (36 and 37).

In early planting- the results indicated that application of 0.0 with each of Giza 674 and Giza 843 gave the highest values of crude protein percentage in leaves. However, the application of 0..0 $P20_5$ with each of Giza 3 , G. 461 and G. 716 showed the highest values of total soluble sugars % and the highest number of aphids was detected by 0.0 P_2O_5 fertilizer with these varieties.

In general, the correlation coefficients between the percentage of soluble sugars (reducing non reducing and total %) in leaves and number of aphids were significant positive values, indicating that increasing soluble sugars increased number of aphids. ,However, insignificant correlation coefficient was detected between crude protein percentage and number of aphids, indicating that number of aphids infestation was not affected by protein percentage.

In the values of planting date (late planting,) the highest values of crude protein were obtained by Giza 674 followed by Giza 843 when unfertilized of phosphorous (0.0 P_2O_5). While higher total soluble sugars percentage was obtained by G.716 and G.843 when unfertilized (0.0 $P20_5$) on the other hand, the highest number of aphids was obtained by G. 716 and G. 843 when unfertilized (0.0 P_2O_5). Also, the lower number of aphids

Effect of interaction between varieties and phosphorous fertilizer levels

The effect of interaction between varieties and phosphorous fertilizer levels on phytochemical contents crude protein %, soluble sugars % (reducing ,non reducing and total %) and L.M infestation in both planting dates are presented in Tables (36 and 37)

In early planting, date (first) , the results indicated that Giza 46 1 and Giza 843 with fertilizer (0.0 P205) gave the highest LM infestation. However, the highest Lm infestation on Giza 461 may be due to the high soluble. Sugars % . Meanwhile, the highest L.M infestation may be due to high crude protein. On the other hand , the lower infestation of L.M was detected by G.3 and G. 716 with 60 kg $P_2$05 / fed. The lower infestation of G.3 and G.716 may be due to high total soluble sugars % and crude protein, respectively

Significant positive correlation coefficients between L.M infestation and each of crude protein % and reducing soluble sugars % indicating that the increasing of reducing soluble sugars % or crude protein % in creased L.M infestation, Table (36).

Table (34): Phytochemical leaf traits and relation between these traits of leaves affected by P- fertilizer and each of aphids and leaf miner infestation in both planting date in the second season .

P_2O_5 kg/fed.	Crude Protein %	Soluble sugars			Average no. of Aphids/ 101eaves	Average no. of leaf miner/10 leaves
		Reducing	Non reducing	Total %		
			Early planting			
0.0	12.6	10.54	9.17	19.71	18.76	14.09
30 kg/fed.	12.26	9.43	7.90	17.33	16.47	13,23
60 kg/fed.	11.39	8.21	6.51	14.72	12.92	12.42
			Late planting date			
0.0	13.3	8.92	9.15	18.08	4.63	11.39
30kg/fed.	12.64	8.02	8.32	16.34	3.49	11.42
60kg/fed.	12.28	7.21	7.18	14.4	2.65	10.31

Table (35): Phytochemical leaf traits and relation between these traits of faba bean leaves and each of aphids and leaf miner infestation in both planting date

Varieties	Crude Protein %	Soluble sugars %			Average no. of Aphids/ 10 leaves	Average no. of LM/ 10 leaves
		Reducing %	Non Reducing	Total %		
Early planting date						
G.3	11.47	9.51	10.52	20.03	16.51	11.52
G.461	11.3	11.06	6.37	17.43	15.15	13.99
G.674	12.58	8.09	5.43	13.52	14.35	13.47
G.716	11.8	9.38	8.73	18.10	17.59	12.39
G.843	13.27	8.93	8.27	17.17	16.15	14.07
,, Late plating date						
G.3	12.9	6.42	6.63	13.05	2.51	12.11
G.461	12.45	8.67	8.48	17.15	3.18	11.23
G.674	13.21	7.67	- 7.62	15.29	2.93	11.89
G.716	11.85	9.06	8.72	17.78	3.79	9.99
G.843	13.28	8.43	9.63	18.06	5.54	9.97

Table (36): Phytochemical leaf traits and relationship effect of interaction between varieties and phosphorous fertilizer levels and each of aphids and leaf miner miner infestation in early planting dates in the second season .

Traits		Crude Protein %	Soluble sugars			Average No. of aphids/ 10 leaves	Average No. of L. M/ 10 leaves
P.	Cvs		Reducing	Non reducing	Total %		
			Early planting date				
0.0	G.3	12.9	10.26	12.52	72 78	18 2·1	I 2,5
	G.461	11.4	12.57	[illegible]	19.99	20.11	15.06
	G.674	13.8	9.58	[illegible]	[illegible]	14.53	13.82
	G.716	11.4	10.58	[illegible]	[illegible]	24.00	13.3
	G.843	13.5	9.73	[illegible]	[illegible]	16.91	15.77
30	G.3	11.2	9.33	[illegible]	[illegible]	15.26	11.86
	G.461	12.3	11.26	7.58	18.84	I 2.85	15.06
	G.674	12.4	8.31	5.22	13.53	16.34	12.12
	G.716	12.3	9.19	8.39	17.58	18.31	13.77
	G.843	13.1	9.04	8.26	17.30	19.58	13.36
60	G.3	10.3	8.95	8.99	17.94	16.04	10.19
	G.461	10.2	9.35	4.10	13.45	12.48	11.85
	G.674	11.55	6.37	4.86	11.23	12.17	11.86
	G.716	11.7	8.36	6.71	15.07	10.47	10.12
	G.843	13.2	8.02	7.88	15.90	11.96	13.09
r. Aph.		0.048	0.53*	0.55*	0.67**		
r.LM		0.55*	0.58*	0.06	0.35		

and ** significant at 0.05 and 0.01 levels of probability, respectively.

Table (37): Phytochemical leaf traits and relationship effect of interaction between varieties and phosphorous fertilizer levels and each of Aphids and leaf miner infestation in late planting date in the second season.

Traits		Crude protein %	Soluble sugars %			Average no. of Aphids	Average no- of L.M.
P.	Cvs		Reducing %	Non-reducing	Total %		
0.0	G.3	13.4	7.18	8.34	15.52	2.04	12.29
	G.461	12.8	9.21	8,33	17.54	4.81	11.6
	G.674	13.9	8.81	8.84	17.65	3.24	11.68
	G.716	12.55	9.86	9.79	19.65	5.62	10.49
	G.843	13.85	9.53	10.49	20.02	7.48	10.89
30	G.3	12.8	6.10	6.56	12.66	3.12	12.78
	0.461	12.8	8.92	9.73	18.65	3.11	10.83
	G.674	13.1	7.92	7.20	15.12	3.07	12.37
	G.716	11.5	9.09	8.66	17.75	3.72	9.76
	G.843	13.0	8.09	9.43	17.52	4.43	11.38
60	G.3	12.5	5.98	5.01	10.99	2.37	11.27
	G.461	11.75	7.88	7.39	15.27	1.63	11.26
	G.674	12.65	6.27	6.83	13.10	2.49	11.63
	G.716	11.5	8.24	7.7	15.94	2.04	9.72
	G.843	13.00	7.69	8.99	16.68	4.72	7.066
r. Aphd		0.46*	0.61*	0.69**	0.68**		
r.L.M.		0.11	-0.31	-0.34	-0.34		

* and ** significant at 0.05 and 0.01 levels of probability, respectively.

In the second planting date , G. 843 followed by Giza 716 had the lower number of larvae and pupae of L.M infestation meanwhile , Giza 3 with unfertilized (0.0p205) and Giza 716 with 30 kg p205 gave the highest infestation by L,.M

Insignificant correlation coefficient between L.M infestation and each of crude protein % and soluble sugars reducing , non :educing and total % indicating that the high or low phytochemical contents had no effect on infestation of LM in the plants of late planing date.

Yield , yield component and insect infestation

1-Effect of seasons .

Results in Table (38) present averages of the two seasons of the study. From the results it was evident that all yield, yield components and insect infestation were significantly variable from season to another . Higher mean values for all characters were detected in the second season except seed infestation where the highest mean value was obtained in the first season. It could be concluded that increased seed yield in the 2nd season may be due to the significant increased in yield components and decreased *Bruchus rufimanus* Boh infestation (Table 30). Also, the different between two seasons may be due to variation of climatic conditions and susceptibility to field infestation with *Aphis craccivora* Koch and leaf miner .

2- Effect of planting date

The difference between two planting dates regarding the yield , yield components and susceptibility of *B. rufimanus* over two seasons combined data reached the significant level (Table 39) . Data showed clearly that the early sowing date (first November) was better than the late one(first Des.)

The depression in seed yield / plot by delaying time of sowing was mainly attributed to the decrease in yield components (100- seed weight , number of pods/plant and seed yield /10 plants and increase in susceptibility to B. rufimanus .

Similar results were obtained by **El-Murabaa** *et al.* **(1987)** and **Michalski (1988)** who found that sowing date affected yield through its influence on the date of successive growth stages and the length of the growth period.

3- Effect of interaction between sowing data and seasons:

Table (39) showed that the effect of interaction between sowing date and season was statistically insignificant for all characters except the susceptibility of B. rufimanus. This result indicates that the effect of the interaction between sowing date and seasons was stable from season to another. For the exceptional character significant effect of this interaction,

indicating that this effect of interaction was changed from season to another.

4- Effect of phosphorods fertilizer levels:

The mean values of yield, yield components and infestation by B.rufimanus as affected by phosphorous fertilization in the combined analysis of the two seasons are presented in Table (40) .

The effect of phosphorous fertilizer levels was statistically significant on all traits under study . The maximum values of yield, yield components and low infestation with B.rufimanus were in applying 60 kg $P20_5$ / fed. While the minimum ones was detected when 15 kg $P20_5$ /fed was applied.

Regarding the effect of p-fertilizer on seed yield /10 plant or plot , data presented in Table (40) revealed that seed yield either per 10 plants or plot, significantly increased as P-level increased from 30 up to 60 kg $P20_5$ / fed. Percentage of increases of seed /plot were 44.19 % and 14.12% in the combined analysis for 60 kg $P20_5$ /fed. compared with 15 and 30kg P205 / fed respectively.

It could be concluded that phosphorous showed a significant effect in increasing the seed yield of faba bean . This result was expected since P-fertilizer increased significantly

number of pods / plot, 100- seed weight and number of seeds per pod (Table 40) .

The effect of p-application on yield and its components could be explained through the role of phosphorous which is extremely important as a structural part of many compounds, notably nucleic acid and phospholipids. In addition, phospholipids plays an indispensable role in energy metabolism, the high energy of hydrolysis of pyrophosphate and various organic phosphate bonds being used to induce chemical reaction . As might be, expected, phosphorous deficiency affects all aspects of plant metabolism and growth (**Bidwell 1979).**

Similar result was obtained by **Abd-El-Rehman** *et al.* **(1979)** and **Abdallah (1986a&b).**

5- Effect of interaction between phosphorous fertilizer levels and season:

Table (40) showed the effect of interaction between levels of phosphorous and seasons. Data indicated that there was a statistical significant effects of the interaction on 100- seed weight, seed yield/ 10 plants and seed yield / plot , revealing that the effect of phosphorous levels was inconstant from season to season.

6- Varietal performance :

The differences among varieties regarding the 100 —seed weight number of pods/ plant, seed yield/ 10 plants or plot and susceptibility with B. rufimanus reached the significant levels (Table 41).

Giza461 cv. had the highest values for seed yield /10 plants or plot and number of pods / plant. Also, it ranked the third c.v. for heavy of seed index. While , it gave the second lowest one for susceptibility with B .rufimanus without difference compared with Giza 674

Giza716 recorded the second values for seed yield /10 plant and plot, number of pods / plant and 100-seed weight. However it ranked the fourth variety for susceptibility with B.rufimanus .

Giza 674 had the highest values for 100 -seed weight and it gave the best variety for susceptibility for B. rufirnanus and the third one for seed yield.

Giza 3 gave the lowest values for yield and showed low susceptibility to B.rufimanus.

Giza 843 had moderatly yield and some of its components and it gave high susceptibility to B .rufimanus.

7-Effect of interaction between varieties and seasons:

Table 41 showed that the effect of interaction between varieties and seasons was statistically significant for. 100-seed weight , seed yield/ 10 plants and plot.

8- Effect of interaction between planting dates and phosphorous fertilizer levels:

The effect of interaction between planting dates and phosphorous fertilizer levels showed a significant effects on 100-seed weight and susceptibility with B .xufinranus (Table 42). However, insignificant effect of this interaction was detected on the other characters , and consequently , the data were excluded.

The highest values for 100-seed weight was obtained from 60 kg P_2O_5 /fed in early planting date. Whereas the lowest one was detected in late planting date with 0.0 P205 / fed .(Table 42).

For susceptibility of B sulimanus the low susceptibility was detected in early planting date by 30kg P_2O_5 / fed. Where as the high susceptibility was showed in late of planting date and 30 kg P_2O_5 / fed.-

9- The effect of interaction between planting date, phosphorous fertilizer levels and seasons.

Table (42) showed the effect of interaction between levels of phosphorous, planting date and seasons. Data indicated that

there was insignificant effects in both characters . This result indicates that the effect of this interaction was stable from season to another.

10- The effect of interaction between planting dates and faba bean varieties

Table (43) includes data of seed yield , its components i.e 100-seed weight and number of pods/plot and susceptibility to B.rufirnanus as affected by interaction effect between planting dates and faba bean varieties, whereas number of seeds/ pod was not affected by this interaction and consequently the data were excluded . These interaction was due mainly to the different ranking of varieties from sowing date to another.

The highest value of 100-seed weight (74.76) was obtained when Giza674 c.v. sown in first planting dates. However, the lowest one was obtained from sowing Giza3 in late planting.

The maximum values of number of pods/ plants, seed yield/10 plants and plot (17.28) 405.72 and 3.55 , respectively , obtained from early sowing with Giza461 C.v. Where as Giza3 cv. gave the minimum values which were 9.37, 183.66 and 1.71 for the respective characters at late sowing date .

The highest susceptibility of B sufimanus was detected when Giza 843 sowing in the 10^{th} . However the lowest one was obtained by Giza674 when sowing in the early date.

11- Effect of interaction between sowing date, varieties and **season.**

Results in Table (43) indicated that the effect of sowing date, varieties and seasons interaction was significant for various parameters except susceptibility of B.rufimanus . This result indicated that the effect of the interaction between sowing date and varieties was charged from season to season.

12- Effect of interaction between varieties and phosphorous fertilizer level:

The effect of interaction between varieties and phosphorous fertilizer level showed a significant effect on seed yield / 10 plants and plot (Table 44). However insignificant effect of this interaction was detected on the other characters and, consequently, the data were excluded.

The highest values for seed yield / 10 plat and plant were obtained by 60 kg **P2 05/** fed. with Giza 461. On the other hand, the lowest ones were detected by 0.0 **P2** O_5 kg/ fed. with Giza 3.

13-Effect of interaction between varieties, phosphorous fertilizer level and season:

The both characters showed insignificant difference due to the effect of this interaction (Table 44). This result may be due to the effect of phosphorous quantities from season to another.

14- effect of interaction between, planting date, phosphorous fertilizer level and varieties

The planting date, phosphorous fertilizer level and varieties interaction over two seasons, showed a significant effect for seed yield / 10 plants and plot (Table 45). However, the other characters were insignificantly affected by this interaction and consequently the data were excluded. Such result indicated that the five varieties showed similar response to planting date and phosphorous fertilizer level .

The highest values of seed yield / 10 plants and plot were obtained by Giza 4 61 at early planting date when supplied with 60 kg P_2O_5 kg/ fed whereas the lowest one was detected by Giza 3M late planting date when unfertilized by P_2O_5.

It could be concluded that the application of 60 kg P_2O_5 / fed at early sowing dale on the 1 st of Nov is the optimal combination for Giza 461 C.V under the condition of this experiment.

Table(38): Average values of yield , yield components and infestation of insects affected by seasons (combined data of (1998/1999/and 1999/2000 seasons)

Season	100seed weight	No. of seeds/ pod	No. of Pods/ plant	Seed yield/ 10 plants	Seed yield/ Plot	Seed *B.rufimanus* %
1998/99	62.49[b]	3.17[b]	7.35[b]	220.10[b]	2.06[b]	4.88[b]
99/2000	70.41[a]	3.42[a]	13.92[a]	331.81[a]	2.92'	2.94'
0.05 L.S.D	1.274	0.09	0.91	14.45	0.12	0.46
0.01	2.148	0.15	1.50	23.99	0.20	0.76

Table (39) Average values of yield , yield components and susceptibility of *B.rufimanus as* affected by planting dates (combined data of (1998/1999and 1999/2000).

Planting date	100-seed weight	No. of seeds/pod	No. of Pods/plant	Seed yield/ 10 plants	Seed yield/ Plot	Seed *B.rufimanus*
Dl (early)	67.27a	3.36	14.32	331.48	2.93	3.09
D2(late)	65.62a	3.24	10.29	220.46	2.05	4.73
LSD 0.05	NS	0.09	0.91	14.45	0.12	0.46
0.01	-	0.15	1.51	23.99	0.2	0.76
F. test DXS	NS	NS	NS	NS	NS	**

Table (40): The average values of yield , yield components and susceptibility of *B.rufimanus* as affected by P-levels (combined. data of (1998/1999 and 1999/2000) seasons.

Trait / P2o5 kg/fed.	100-seed *weight*	No. of seed/pod	No. of Pods/pi **ant**	Seed yield/ 10 plants	Seed yield/ Plot	No. of *B.rufimanus* %
0.0	64.72	3.15	10.76	225.32	2.01	3.57
30 kg/fed	66.39	3.33	12.47	283.91	2.55	4.08
60 kg/fed	68.24	3.42	13.68	318.68	2.91	4.08
0.05 L.S.D.	0.589	0.05	0.54	10.26	0.10	0.29
0.01	0.812	0.08	0.72	14.13	014	0.40
F. test (PXS)	**	TS	NS	**	*	NS

Table (41): Average values of yield , yield components and susceptibility of *B.rufimanus as* affected by varieties (combined data of (1998 and 1999/2000) seasons.

Variety	100-seed weight	No.of seeds/pod	No. of Pods/plant	Seed yield/ 10 plants	Seed yield/Plot	No. of *B.ruJimanus*
Giza3	61.84	3.14	11.32	227.64	2.08	3.78
Giza461	65.92	3.23	14.67	322.4	2.87	3.69
Giza716	67.27	3.38	13.05	303.19	2.71	4.19
Giza674	72.88	3.44	10.46	268.03	2.43	3.36
Giza843	64.34	3.31	11.93	258.57	2.38	4.53
0.05	1.25	NS	0.73	12.22	0.12	0.42
LSD 0.01	1.66	-	0.98	16.25	0.15	0.56
F. test VXS	**	NS	NS	**	**	NS

Table (42):The average values of 100-seed weight and phosphorous levels (combined data of 1998/99 and 99/2000 seasons).

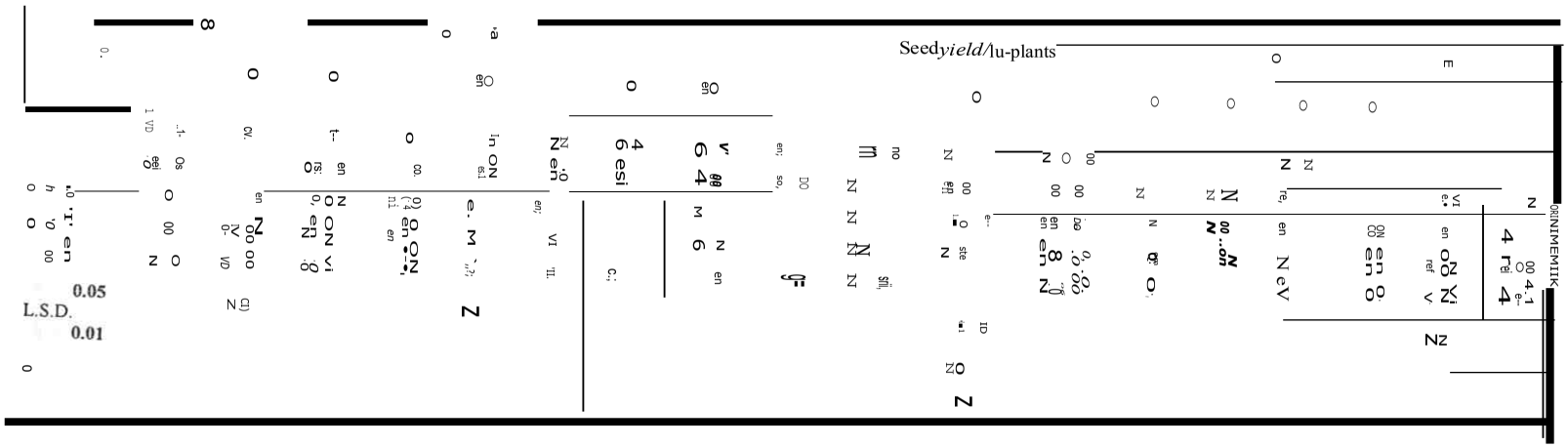
Traits	100 seed weight			No. of seeds pod			No. of pods/plant			Seed yield 10 plants			Seed yield plot			No. of *B.rufimanus* %		
P. / D.	0	30	60	0	30	60	0	30	60	0	30	60	0	30	60	0	30	60
D1	65.38	66.72	69.72	3.20	3.4	3.47	12.41	14.44	15.4	267.71	342.31	384.42	2.35	3.03	3.41	3.0	2.93	3.33
D2	64.04	66.07	66.76	3.10	3.25	3.37	9.11	10.45	11.3	182.93	225.51	252.94	1.67	2.07	2.41	4.13	5.23	4.08
LSD 0.05	0.83			NS			NS			NS			NS			0.41		
LSD 0.01	1.15															0.56		
Fresc (DxFxS)	NS			NS			NS			NS			NS			NS		

D.planting date.

of interaction between planting dates and faba bean varieties (combined data of (1998/1999 and 1999/2000 seasons)

Trait	100-seed weight		No of seed pod		No of/pods plant		Seed yield/lOplant		Seed yield/ plot		No. of*B.rufimanus*%	
date	D1											
y												
	61.58		3.18				71.63	183.66	2.45	1.71	3.61	
	66.99		3.3									
			3.44									
			3.47									
			3.3				99.67				3.7	
L.S.D	1.76		NS		1.04		17.20		0.16	0.16	0.6	
			-		1.38							
test	**		NS		**		**		**		NS	

Table (44): The average values of seeds yield , yield components as affected by interaction between phosphorous fertilizer levels and faba bean varieties (combined data of both seasons (1998/1999 and 1999/2000) seasons.

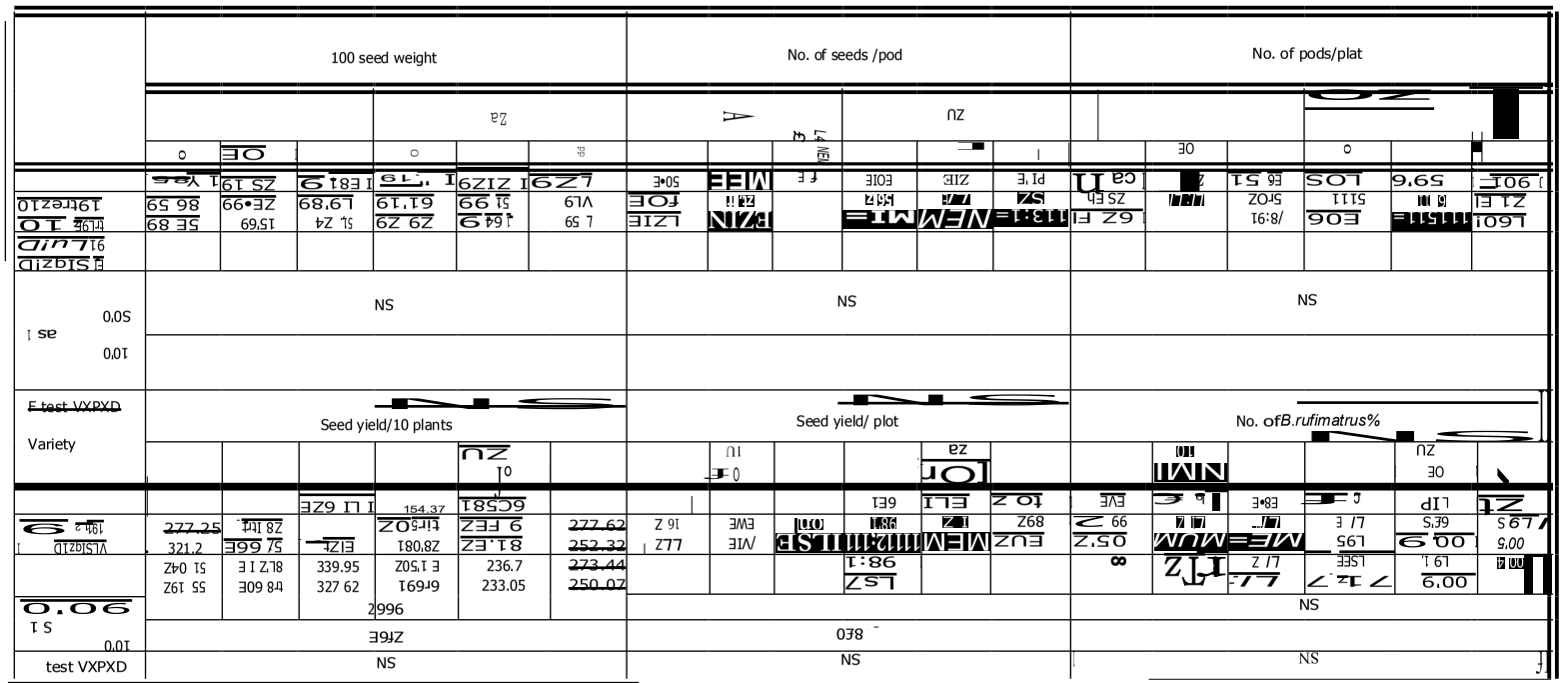


P. Planting date

Cvs. Cultivars

Table (45): Average

planting date, phosphorous fertilizer levels and faba bean varieties (combined data of both



15- Effect of interaction between varieties, planting date, phosphorous fertilizer level and season:

The effect of third interaction and season was insignificant for both characters.

The second part:-

A- Infestation potential of *Callosobruchus maculatus* on different pulse seeds.

A.1- Susceptibility of faba bean varieties:-

The five varieties of faba bean seeds namely Giza3, Giza461, Giza674, Giza7 16 and Giza843 were used in this study . Data presented in Table (46) showed the effect of five faba bean cultivars on number of eggs, number of hatched eggs number of adult emergence, hatching adult emergence % mean developmental period (MDP), susceptibility index (SI) of C. maculatus and weight loss (%) .

The results were significantly affected by faba bean cultivars except MDP days and SI.

Concerning number of eggs , Giza3 gave the highest no. of eggs but without superiority then Giza 461 and Giza 716. However, the two varieties Giza 674 followed by Giza 843 gave the lowest one. **Chavan et al. (1997a)** mentioned that smooth texture and dark colored seeds were preferred by C.maculatus for oviposition than rough surface and white colored seeds.

For number of hatch eggs, Giza 674 followed by Giza 716 had the highest number of larvae penetration (hatch eggs) . Meanwhile, the other three cultivars gave the lowest ones.

Regarding number of adult insects, Giza674 had the highest number, while, Giza461 gave the lowest one. G. 674 gave the highest percentage of hatching (penetration %) but it had the lowest adult emergence %. It could be concluded that the seed coat of this variety increased the penetration of the larvae while the chemical composition decreased the adult emergence % . On the other hand , Giza 3 , Giza 461 and Giza 843 showed higher hatching rates and high adult emergence. This result may be due to the thickness and the chemical composition of seed coat.

For MDP (days) and susceptibility index to C.maculatus, results indicated that insignificant effect of faba bean cultivars (Table 46).

The SI ranged from 5.25 (G.3) to 4.71 (Giza674). Also, MDP ranged from 3(G.843) to 3(G.3) days.

Janzen (1977) analyzed the perforation capacity of C. maculatus larvae in seeds of 73 species of leguminousae and observed the importance of the seed coat in the relationships between the bruchids and their host plants. The seed coat prevented the penetration of the larvae in 69.5% of the tested

seeds. Once again the texture of seed coat, its thickness and chemical composition may explain these results.

Regarding weight loss (%) , Giza 843 gave the highest loss, (7%) followed by G. 461 (6.66) However, the G. 716 gave the lowest one (4.86%).

A.2. Susceptibility of some pulse seeds:

Many criteria for determining the relative susceptibility or resistance of different pulses to bruchid infestation, such as oviposition (fecundity) no.of eggs , no of egg hatch or larval penetration and larvae penetration % , mean developmental period (MDP) , number of emerged progeny, adult emergence % and weight loss % have been used.

The obtained data of five faba bean *(Vicia faba* L) varieties per 8 pairs of insects in the first part were averaged as well as some pulses seeds i.e. cowpea, Mung bean *(Vigna radiate,* L.) , pea , *Pisum sativum* **L.,** lentils *(Lens esculent,* L.) and kidney been *(Phaseolus vulgaris* L.) were statistically analyzed for comparing the species behavior and its response to infest and damage the different pulse for each species .

Data presented in Table (47) showed significant effect of six species on all studied traits. The high oviposition rate (no.) /8 female C. maculatus was recorded on mung bean followed by kidney bean . While, the lower no. of eggs was recorded on

lentil. The order of preference for C.maculatus was mung bean > kidney bean > cowpea >Saba bean > pea> lentil.

In general, each pulse had its own effect on no. of eggs laying (fecundity) where seed weight, color ,texture and seed coat thickness as physical characters and moisture content , total crude protein, ash, crude fiber, tannins and total phenols as chemical characters did not provide chances or reduce oviposition.

Regarding no. of hatch or penetration % the highest value was recorded by mung bean followed by cowpea for no. of hatch eggs , while cowpea followed by mung bean for hatching %. However, faba bean and lentil gave the lowest no of hatch eggs . While, faba bean , kidney bean and pea gave the lowest values of hatching % (penetration %) . This result was in agreement with those obtained by **Ghareab, (2000).**

Mung bean followed cowpea had the highest no. of adult insect adult emergence % and susceptibility index (moderately susceptible(MS).

However, the two previous species gave the lower MDP (days) . It could be concluded that mung bean and cowpea were

considered the best suitable for the developmental period, and adult emergence %.

On the other hand , kidney bean followed by lentil had the lowest values for number of adult insect (0.0 at 5.33), adult emergence % (0.0 and 9.12 %) and SI (0.0 to 2.28) , respectively . While , MPD (days) was 0.0 by kidney bean and 42 by lentil .It could be concluded that the duration of developmental period of C.maculatus, the pulses as kidney bean and lentil considered as the most unsuitable ones.

For weight loss %, mung bean followed cowpea had the highest weight loss % and it considered highly susceptible (H.S). However kidney bean had 0.0% of weight loss , also, lintel , faba bean and pea gave the lowest % of weight loss and considered least susceptible (LS) .

B- preference:

Insignificant differences between faba bean cultivars for preferring insects (Fig 8). Meanwhile, significant differences between species (different pules seeds) to preferring insects of C. maculatus. Cowpea and kidney bean gave the highest infestation with C. maculatus . However, lentil seeds showed lower infestation by C. maculatus.

Table (47): Mean values of some biological aspects of *Callosobruchus maculatus* (F.) at 28± lc° and 60± 5%RH on some species of pulse crops

Pulse seed	No. Of eggs	No. of [illegible]	[illegible] ing %	No of adult insect	[illegible] ult e[illegible]nce %	[illegible]DP ([illegible]AY)	(S.I)	Weight Loss %
Faba bean	[illegible]	[illegible]	46.43c	[illegible]	[illegible]	36.4ab	[illegible]	5.94cd
Cowpea	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	172.51a	[illegible]	[illegible]	99.31a	30b	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40a	4.64b	[illegible]
Le[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.12d	[illegible]	[illegible]	[illegible]
Ki[illegible]	[illegible]	95.25c	51.12c	0.0e	0.0e	0.0e	0.0e	0.0e