RESULTS AND DISCUSSION

I. Growth characters:

1. Seed germination percentage:

Results in Table (4) show significant differences in faba bean seed germination percentage as affected by planting date or phosphatic treatments and their interaction.

Faba bean seeds planted on the later date (Nov. 28) always had the highest germination percentage during the experimental seasons (2003/04 and 2004/05) and significantly differed compared to the other two planting dates during 2003/04 season and to the early planting date during 2004/05 season.

The two early planting dates exchanged the superiority in increasing germination percentage. The medium planting date (Nov. 13) showed a significant increase during the second season, whereas the increase in germination percentage which recorded by the early planting date (Oct. 29) didn't reach the level of significance during the first one. This may be due to the effect of environmental conditions.

Similar results were reported by **El-Murabaa *et al.* (1987-b)** who found that late planting date (Nov. 25) improved field bean emergence compared to earlier dates viz., Sept. 25 and Oct. 25. On the other hand, **Shaker (2001)** found that the suitable dates for seed germination in the field was 15^{th} of Sept. for faba bean cv. Narina and from 1^{st} to 15^{th} of Sept. for cv. Broco.

Table (4): Seeds germination percentage of faba bean in laboratory as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	93.00	94.00	94.75	93.917	94.50	97.50	97.50	96.50
Bio-I	94.50	94.50	96.00	95.00	97.50	98.75	98.00	98.083
Bio-II	96.75	94.75	96.75	96.083	97.50	97.75	98.50	97.917
Min. I	93.75	94.25	97.50	95.167	96.25	98.25	98.75	97.75
Min. II	97.50	94.75	96.00	96.083	96.50	98.25	99.00	97.917
Bio-I + Min.-I	97.75	94.50	96.75	96.333	97.50	98.25	97.75	97.833
Bio-I + Min.-II	94.25	96.00	95.00	95.083	95.50	98.25	98.50	97.417
Bio-II + Min.-I	94.50	94.50	97.50	95.50	96.25	98.25	98.75	97.75
Bio-II + Min.-II	94.75	94.75	98.00	95.833	98.80	98.75	98.50	98.667
Mean	95.194	94.667	96.472	95.444	96.694	98.222	98.361	97.759

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 1.19	= 0.89
Fertilization	(F)	= 0.49	= 0.39
Interaction	F. x P.	= 0.85	= 0.67

Concerning phosphatic fertilization effect on germination percentage of faba bean seeds, data in Table (4) clearly indicate a significant effect during the two experimental seasons. In the same time all plots received mineral or biological rates of phosphatic fertilization significantly raised germination %than that without phosphatic application (the control). It is noticed that biological phosphorus slightly surpassed mineral P and the high rate of each gave a slight increase for germination %. Combination of mineral and biological P slightly improved the germination % than being in a single state, while the highest germination % was recorded with Bio-I +Min-I in 2003/04 season and with Bio-II + Min-II in 2004/05 season.

Data also clear a significant effect for the interaction between planting date and P fertilization on germination % during the experimental seasons (Table, 4). Germination % improved with delaying planting date and increasing P rates. The highest values for germination % were noticed with late planting date 28/11 of plots receiving P at rates of bio-II + Min-II and Min-II in 2003/04 and 2004/05 seasons, respectively.

The lowest values were recorded in plots received no P and planted on the early date 29/10.

2. Plant height (after 100 days from planting):

Results in Table (5) show a significant effect for planting dates on plant height during the two experimental seasons and for P fertilization during the first season (2003/04) only, but the interaction between planting dates and P fertilization did not significantly affect plant height during 2003/04 and 2004/05 seasons.

The tallest faba bean plants were shown when planting date took place on Oct. 29 during the first season and on Nov. 13 during the second one recording 111.1 cm and 120.5 cm in the first and second seasons respectively. The two mentioned values for plant height significantly differed compared to the values of the other two planting dates. The next planting date for increasing plant height was Nov. 13 in the first season and Nov. 28 in the second one. The differences in plant height didn't reach the level of significance between Nov. 13 and 28 in the first season or between Oct. 29 and Nov. 28 in the second one. This result may be due to the change in environmental condition from the early planting date to the late planting one. Similar results were reported by **Shaker (2001) and Mekky *et al.* (2003).** On the other hand, **Bakheit *et al.* (2001)** found that delaying planting date to Nov. 10 produced the tallest plants than Oct. 1st or 20th planting dates.

Table (5): Faba bean plant height (cm) after 100-days from planting date, as influenced by planting dates, and chemical and bio-phosphatic fertilization treatments in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	105.125	101.80	102.225	103.05	102.85	113.025	106.40	107.425
Bio-I	113.625	106.60	105.075	108.433	104.80	117.05	110.575	110.808
Bio-II	109.60	103.975	105.025	106.20	103.45	125.45	115.475	114.792
Min. I	114.175	107.375	106.675	109.408	106.675	122.40	111.89	113.655
Min. II	109.05	104.825	103.425	105.767	106.70	124.875	109.325	113.633
Bio-I + Min.-I	108.65	105.775	107.05	107.158	106.35	122.80	114.375	114.508
Bio-I + Min.-II	115.95	110.575	105.55	110.692	105.90	121.275	112.50	113.225
Bio-II + Min.-I	110.30	103.90	102.203	105.468	109.30	119.525	111.775	113.533
Bio-II + Min.-II	113.475	103.80	104.65	107.308	105.10	117.90	113.35	112.117
Mean	111.106	105.403	104.653	107.054	105.681	120.478	111.741	112.633

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 4.093	= 8.258
Fertilization	(F)	= 4.534	= N.S
Interaction	F. x P.	= N.S	= N.S

Concerning the effect of P fertilization on plant height data in Table (5) indicate a slight increase as dose of biological or mineral P decreased through 2003/04 season. The application of biological and mineral P as a single or in combination at different rates gave slight increase in plant height. The tallest plants were shown in plots received Bio-I + Min-II (110.69 cm) followed by Min-I (109.4 cm) which significantly differed compared to the control (103.05 cm) during the first season.

In spite of the insignificant effect of P fertilization on plant height during 2004/05 season, the application of Bio-II gave the tallest plants followed by Bio-I + Min-I treatment, but the control produced the shortest ones. It seemed that application of P enhanced merstematic activity which encouraged growth and plant height. Similar result was obtained by **Salem and El-Massri (1986), Radwan (1992), Bahr (1997), El-Kalla *et al.* (1999) and Abdalla (2002)**

Although, plant height was not significantly affected by the interaction of planting date x P fertilization, plots planted on Oct. 29 and received Bio-I + Min-II in the first season and those planted on Nov. 13 and fertilized by Bio-II in the second season gave the tallest plants, while the shortest plants were shown on plots planted on Nov. 13 and Oct. 29 with no P fertilizer (the control) during the first and second seasons, respectively.

3. Number of branches/plant at 100 days from planting date:

Results in Table (6) show a significant effect on number of branches at 100 days from planting due to the treatments of planting date and P fertilization during 2003/04 and 2004/05 seasons and their interaction during 2004/05 season only.

Number of branches/plant gradually decreased by delaying planting date up to Nov. 28 during the two experimental seasons. (Table, 6). The greatest number of faba bean branches/plant was shown in plots planted on Oct. 29 recording 2.598 and 2.730 values during the first and second seasons, respectively. The early and medium planting dates (Oct. 29 and Nov. 13) significantly enhanced number of branches/plant compared to the late date of Nov. 28, but the difference between the early and medium planting dates was not significant during the two experimental seasons. The result is similar to those reported by **Amer *et al.* (1992), and Shaker (2001)**. An opposite trend was recorded by **Bakheit *et al.* (2001) and Mekky *et al.* (2003)** whereas they obtained more number of branches as planting date was delayed.

All plots received P fertilization significantly increased number of branches/plant compared to the unfertilized plots (control) during the two experimental seasons, except, bio-II treatment in 2003/04 season, (Table, 6).

Table (6): Number of branches/plant of faba bean, after 100-days from planting date, as influenced by planting dates, and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	2.487	2.500	2.275	2.421	2.675	2.413	2.337	2.475
Bio-I	2.587	2.613	2.45	2.550	2.738	2.525	2.387	2.550
Bio-II	2.525	2.633	2.35	2.502	2.713	2.612	2.463	2.596
Min. I	2.575	2.575	2.478	2.546	2.73	2.712	2.40	2.617
Min. II	2.582	2.575	2.45	2.536	2.762	2.700	2.438	2.633
Bio-I + Min.-I	2.650	2.613	2.438	2.567	2.738	2.775	2.413	2.642
Bio-I + Min.-II	2.662	2.625	2.413	2.567	2.75	2.762	2.400	2.638
Bio-II + Min.-I	2.662	2.618	2.337	2.539	2.738	2.775	2.40	2.637
Bio-II + Min.-II	2.650	2.618	2.387	2.552	2.725	2.775	2.413	2.638
Mean	2.598	2.596	2.399	2.531	2.730	2.672	2.406	2.603

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 0.143	= 0.070
Fertilization	(F)	= 0.084	= 0.0646
Interaction	F. x P.	= N.S	= 0.112

A slight but insignificant increase in number of branches/plant was shown in plots fertilized with the lower dose of organic or mineral P as a single application in the first season, but in the second one the high dose gave the same result.

There is no obvious trend for increasing number of branches/plant by using P fertilization in any form or any dose, except with Bio-I + Min-I and Bio-I + Min-II treatments, which recorded the greatest number of branches (2.567, 2.567 and 2.642, 2.638) during 2003/04 and 2004/05 seasons, respectively. The increase in number of branches/plant may be due to the stimulating effect of P on plant growth. The result is in agreement with those reported by **Salem nd El-Nakhlawy (1987), Said (1998), El-Kalla *et al.* (1999) and Saad and El-Kholy (2000).**

The interaction of planting date x P fertilization significantly affected number of branches/plant during the first season, (Table, 6). The greatest number of branches/plant was obtained by the interaction of Bio-I + Min-II and Bio-II + Min-I under Oct. 29 planting date during the first season, which recorded equal values (2.662). In the second season, the highest value (2.775) for number of branches/plant was shown in plots of Bio-I + Min-II, Bio-II + Min-I and Bio-II + Min-II under Nov. 13 planting date. The lowest number of branches/plant was obtained by the interaction of the control under Nov. 28 planting date during the two experimental seasons.

4. Fresh weight (g)/plant:

Faba bean fresh weight per plant at 100 days from sowing was significantly affected by planting dates during 2003/04 and 2004/05 seasons, (Table, 7).

The early planting date (Oct. 29) surpassed the other two planting dates (Nov. 13 and Nov. 28) and recorded a significant increase for fresh weight/plant during 2003/04 season. The next weight was shown with planting date of Nov. 13 but without significant difference compared to the later planting date (Nov. 28) during the same seasons. In 2004/05 season, the heaviest weight for faba bean plants was recorded by planting on Nov. 13 and significantly differed compared with the early planting date (Oct. 29) or the latest planting date (Nov. 28). Results also show no significant difference between the early and medium planting dates concerning fresh weight/plant in spite of the increase shown with the early planting date.

The results show that the early planting for faba bean seeds during Oct. 29 or Nov. 13 is suitable for plant growth, (Table, 7). This result is in agreement with that obtained by **Bakheit *et al.* (2001).**

Data in Table (7) show a significant effect on faba bean fresh weight/plant during the two seasons by P fertilization. All P fertilization treatments significantly increased fresh weight per plant compared to the control, except Bio-II treatment in the first season and Bio-I, Min-I and Bio-I + Min-II in the second season.

Table (7): Fresh weight per plant (gm) of faba bean, after 100-days from planting date, as influenced by planting dates, and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	339.375	241.75	248.125	276.417	224.68	277.50	221.55	241.246
Bio-I	388.125	313.70	309.375	337.067	227.28	304.67	225.60	252.52
Bio-II	345.375	277.875	286.125	303.125	266.56	305.30	231.75	267.87
Min. I	393.00	274.875	280.00	315.958	226.08	295.82	227.55	249.82
Min. II	371.875	293.75	320.125	328.58	276.25	301.22	255.43	277.63
Bio-I + Min.-I	362.50	332.50	277.50	324.167	282.5	299.12	237.55	273.05
Bio-I + Min.-II	389.375	301.875	293.125	328.125	240.0	295.92	227.30	254.40
Bio-II + Min.-I	359.00	319.375	304.375	327.58	293.25	299.00	234.25	275.5
Bio-II + Min.-II	390.00	299.375	308.125	332.50	272.80	280.00	232.63	261.80
Mean	370.958	295.008	291.875	319.281	256.60	295.39	232.62	261.54

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 22.028	= 29.38
Fertilization	(F)	= 27.49	= 14.979
Interaction	F. x P.	= N.S	= 25.946

Raising P rate either in a mineral or biological form as a single application produced heavy fresh weight per plant during the two seasons, except Bio-I in 2003/04 season. Application of P fertilization in combination slightly enhanced the increase in fresh weight per plant. The heaviest fresh weight per plant was obtained by Bio-I followed by Bio-II + Min-II treatments in 2003/04 season and by Min-II followed by Bio-II + Min-I in 2004/05 season.

Generally, results show that the application of P fertilization to faba bean plant in mineral or biological form was useful and slightly improved fresh weight as P rate increased either in a single or in combination form. This may be ascribed to the control role of P in energy of metabolism of the cell, protein synthesis, photosynthetic, CO_2 fixation and other anabolic and catabolic pathways (**Bieleski, 1973**). Many investigators obtained similar results **(Radwan 1992, Arafat *et al.* 1995, Reda *et al.* 1996, Saad and El-Kholy 2000 and Saleh *et al.* 2000)**

The interaction effect between planting dates and P fertilization on fresh weight of faba bean plants was significant only during 2004/05 season. The highest values were obtained by Nov. 13 planting date and Bio-II followed by Bio-I treatment. The lowest value was shown with plots planted on Nov. 28 and received no P fertilization.

II. Yield component characters:

1. Number of branches/plant at harvest:

Data in Table (8) indicate that planting date and P fertilization treatments significantly affected number of faba bean branches/plant during the 2003/04 and 2004/05 seasons, but their interaction has the same effect during 2004/05 season only.

Early planting gradually increased number of branches/plant and recorded the highest values when planting date took place on Oct. 29 followed by Nov. 13 but the lowest number was shown with Nov. 28 planting date during the two seasons.

The increase in number of branches/plant was significant between Oct. 29 planting date and the two other dates during the first season and between all planting dates during the second season. The highest values were obtained by Oct. 29 planting date recording 3.076 and 2.914 branches/plant during the first and second seasons, respectively, while the lowest numbers (2.553 and 2.328) were obtained by Nov. 28 planting during the same seasons. These results agree with those reported by **McVetty *et al.* (1986), El-Murabea *et al.* (1987a), Amer *et al.* (1992) and Shaker (2001)**

The application of P fertilization significantly increased number of branches/plant at harvest compared to the control treatment, during 2003/04 and 2004/05 seasons, (Table, 8).

Table (8): Number of branches per plant of faba bean as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	2.925	2.50	2.412	2.613	2.837	2.70	2.20	2.579
Bio-I	3.00	2.625	2.525	2.717	2.95	2.787	2.363	2.70
Bio-II	3.15	2.688	2.613	2.817	2.962	2.788	2.30	2.683
Min. I	3.113	2.812	2.637	2.854	2.875	2.95	2.275	2.70
Min. II	3.075	2.70	2.625	2.800	2.938	2.738	2.325	2.667
Bio-I + Min.-I	3.225	2.575	2.50	2.787	2.90	2.838	2.362	2.70
Bio-I + Min.-II	3.125	2.637	2.55	2.771	2.887	2.763	2.30	2.65
Bio-II + Min.-I	3.038	2.637	2.538	2.738	2.938	2.775	2.40	2.704
Bio-II + Min.-II	3.038	2.625	2.575	2.746	2.938	2.813	2.425	2.725
Mean	3.076	2.644	2.553	2.758	2.914	2.794	2.328	2.679

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 0.1689	= 0.096
Fertilization	(F)	= 0.083	= 0.054
Interaction	F. x P.	= N.S.	= 0.094

Raising the dose of P fertilization as a single application of biological or mineral forms slightly affected number of branches/plant during the two seasons, without significant difference, except with the biological form, which significantly increased number of branches by increasing its dose during the first season, (Table, 8).

Application of P fertilization in combination of biological and mineral forms at different rates gave similar results as the single application of the two forms during the two seasons. The greatest number of branches/plant (2.854) was obtained by Min-I followed by Min-II which recorded 2.8 during 2003/04 season. In the second season, the best values were 2.725 and 2.704 recorded by Bio-II + Min-II and Bio-II + Min-I, respectively. Similar results were obtained by **Salem and El-Massri (1986), Salem and El-Nakhlawy (1987), El-Kalla *et al.* (1999) and Saad and El-Kholy (2000).**

The interaction effect of planting date x P fertilization was significant during 2004/05 season only, (Table, 8). The highest number of branches/plant was achieved by the interaction of Bio-I + Min-I with Oct. 29 planting in the first season and Bio-II with Oct. 29 planting in the second season, being 3.225 and 2.962 branches, respectively. On the other hand, the interaction of the control x Nov. 28 planting recorded the lowest values (2.412 and 2.20) for number of branches/plant, during 2003/04 and 2004/05 seasons, respectively.

2. Number of dry pods /plant:

Number of faba bean pods was significantly affected by both planting dates and P fertilization during 2003/04 season only, whereas, the interaction of the two mentioned factors was not significant during the two experimental seasons (Table, 9).

Number of pods/plant gradually decreased by delaying planting date after Oct. 29 to Nov. 28. The greatest number of pods (14.27 and 12.204)/plant was noticed with the early planting date Oct. 29 during the two seasons followed by Nov. 13 which recorded 12.47 and 11.67 pods/plant during 2003/04 and 2004/05 seasons, respectively, while the late planting date (Nov. 28) gave the lowest value for pod number/plant (11.35 and 10.89) during the two seasons. Similar result were obtained by **El-Murabaa *et al.* (1987a)** when planting date was Oct. 25 and **Amer *et al.* (1992)** when planting date took place on Nov. 1st compared to Nov. 30th planting date.

The significant increase was noticed with the early planting date (Oct. 29) compared to the late planting date (Nov. 28) only, while the difference between Nov. 13 planting date and the other two planting dates didn't reach the level of significance during 2003/04 season.

P fertilization treatments significantly increased pod number per plant compared to the control treatment in 2003/04 season only. The application of biological or mineral P fertilizer being single or in combination gave similar results for their effect on pod number/plant. A slight increment was achieved by Min-II in 2003/04 season and Min-I in 2004/05 season, (Table, 9).

This may be due to that P encouraged vegetative growth of faba bean plants as well as flowering and fruiting. The result agrees with those obtained by **El-Kalla *et al.* (1999), Saad and El-Kholy (2000), Zeidan *et al.* (2001) and Abdalla (2002).**

Regarding the interaction effect, results in Table (9) show that the greatest increase in pod number/plant was recorded by planting on Oct. 29 x Bio-II + Min-I or Min-II in 2003/04 season and Nov 13 x Min-I followed by Oct. 29 x Bio-II + Min-II in 2004/05 season.

Table (9): Number of pods per plant of faba bean as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	12.025	10.675	10.063	10.921	10.887	10.825	10.103	10.605
Bio-I	14.938	13.413	10.888	13.079	11.638	11.06	10.525	11.074
Bio-II	13.082	12.712	11.75	12.515	11.987	11.45	11.787	11.742
Min. I	13.587	11.925	11.987	12.50	13.05	13.40	11.50	12.65
Min. II	16.438	12.987	11.310	13.578	12.85	11.838	10.595	11.761
Bio-I + Min.-I	14.187	13.087	10.764	12.68	11.325	12.112	11.325	11.587
Bio-I + Min.-II	13.312	12.085	12.125	12.763	12.775	11.362	10.537	11.558
Bio-II + Min.-I	17.100	11.851	10.462	13.138	12.00	11.40	11.15	11.517
Bio-II + Min.-II	13.775	12.725	12.837	13.112	13.325	11.588	10.475	11.796
Mean	14.272	12.47	11.354	12.698	12.204	11.671	10.889	11.588

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 2.0378	= N.S
Fertilization	(F)	= 1.455	= N.S
Interaction	F. x P.	= N.S	= N.S

3. Pods weight/plant:

Results in Table (10) show a significant effect on faba bean pods weight as affected by planting date in 2004/05 season only and by P fertilization treatments during 2003/04 and 2004/05 seasons. On the other hand, the interaction of planting date x P fertilization had no significant effect on the same trait.

The lowest value of pods weight/plant was recorded by the early planting date (Oct. 29) and significantly differed compared to the other two late planting dates (Nov. 13 and 28) in 2004/05 season. At the same time, planting date of Nov. 13 gave the highest value without significant difference compared to planting date of Nov. 28 during 2004/05 season.

In spite of the unsignificant difference between planting dates in pods weight/plant during 2003/04 season, the Nov. 13 planting date recorded the highest value followed by Oct. 29 planting date. **Mekky *et al.* (2003)** recorded the highest value for pods weight/plant when sowing took place on Nov. 1st compared to Nov. 15th or Nov. 30th.

Most of P fertilization treatments significantly increased pod weight/plant compared to the control treatment during the two experimental seasons. The greatest increment was recorded by Min-II during the two seasons followed by Min-I and Bio-I + Min-II in 2003/04 season, respectively and by Bio-II and Bio-II + Min-II in 23004/05 season, respectively. Increasing P rate as a biological or mineral form slightly increased pods weight/plant. Also, the application of mineral and biological P in combination gave similar increment as single application of both during the two seasons. Similar result was obtained by **Hassanein (1995)**, but **El-Douby and Samia Mouhamed (2002)** found no significant effect on pods weight/plant.

Table (10): Pods weight per plant (g) of faba bean as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Season / Planting date / P Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	25.723	26.95	24.64	25.771	22.90	24.625	24.45	23.992
Bio-I	29.033	28.127	25.78	27.647	23.325	26.10	29.05	26.158
Bio-II	27.735	28.383	26.56	27.559	24.025	29.175	30.525	27.908
Min. I	27.475	28.907	28.91	28.431	24.50	28.525	25.975	26.333
Min. II	31.770	29.815	25.908	29.164	25.80	29.85	28.30	27.983
Bio-I + Min.-I	26.822	27.993	27.343	27.386	23.125	31.525	27.75	27.467
Bio-I + Min.-II	27.865	29.425	26.953	28.081	23.875	27.90	26.15	25.975
Bio-II + Min.-I	27.735	27.347	25.652	26.912	24.75	29.15	27.025	26.975
Bio-II + Min.-II	28.515	28.778	26.175	27.823	24.125	30.115	28.225	27.50
Mean	28.075	28.414	26.436	27.641	24.047	28.556	27.494	26.699

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= N.S.	= 1.984
Fertilization	(F)	= 1.864	= 2.315
Interaction	F. x P.	= N.S	= N.S.

The interaction between planting dates and P fertilization had no significant effect on pod weight/plant during 2003/04 and 2004/05 seasons. The highest values were shown with the interaction of Oct. 29 x Min-II followed by Nov. 13 x Min-II in 2003/04 season and with the interaction of Nov. 13 x Bio-I + Min-I followed by Nov. 28 x Bio-II in 2004/05 season, while the lowest value was recorded by the control x Nov. 28 in 2003/04 season and the control x Oct. 29 in 2004/05 season.

4. Seed yield/plant:

Seed yield of faba bean plants significantly affected by planting date during 2004/05 season only and by P fertilization during the two seasons, while the interaction between planting date and P fertilization showed no significant effect during the two seasons, (Table, 11).

Delaying planting date to Nov. 13 or 28 significantly increased seed yield compared to the early planting date of Oct. 29 as indicated in Table (11). The highest values for seed yield were recorded when planting date took place on Nov. 13 during the two seasons. The next rank was achieved by Nov. 28 planting date which showed no significant difference compared to Nov. 13 planting date in 2004/05 season. In spite of the insignificant effect of planting dates on seed yield/plant during 2003/04 seasons, a slight increase was recorded by Nov. 13 followed by Oct. 29 planting dates compared to Nov. 28 one. The result is in agreement with those of **McVetty *et al.* (1986), Amer *et al.* (1992, 1997) and Mekky *et al.* (2003).**

Table (11): Seed yield per plant (gm) of faba bean as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	19.45	20.40	19.5677	19.809	16.50	19.475	19.625	18.53
Bio-I	23.355	22.39	20.635	22.127	17.26	20.825	22.30	20.128
Bio-II	21.832	22.33	21.088	21.75	18.925	23.225	23.975	22.042
Min. I	21.892	22.857	23.20	22.65	19.40	23.025	21.00	21.142
Min. II	25.510	23.195	20.868	23.191	19.30	23.75	22.25	21.767
Bio-I + Min.-I	20.803	21.678	21.923	21.468	17.925	24.875	21.975	21.592
Bio-I + Min.-II	22.515	23.145	20.985	22.215	17.00	22.35	20.65	20.00
Bio-II + Min.-I	21.613	22.130	21.327	21.69	19.225	23.25	21.525	21.33
Bio-II + Min.-II	23.170	22.608	21.118	22.298	19.00	24.50	22.925	22.142
Mean	22.238	22.304	21.191	21.911	18.282	22.808	21.803	20.964

L.S.D. 5%		2003/04	2004/05
Planting date	(P)	= N.S	= 1.558
Fertilization	(F)	= 1.592	= 2.1668
Interaction	F. x P.	= N.S	= N.S

Regarding P fertilization effect on seed yield/plant, data in Table (11) indicate that, all P fertilization treatments significantly increased seed yield/plant during the two seasons compared to the control treatment, except Bio-I and Bio-I + Min-II in the second season, which recorded insignificant increment. Increasing P rate as biological on mineral form increased seed yield slightly. Application of P fertilization in any form being single or in combination gave similar results on seed yield/plant. The highest values were shown with Min-II P treatment followed by Min-I during 2003/04 season and with Bio-II + Min-II treatment followed by Bio-II one during 2004/05 season.

Such result indicates the importance of P to encourage plant growth, pod setting and pod and seed filling. This might interpret the increase in weight of seeds/plant and this might account much for a good seed filling and subsequently higher seed yield. The results agree with those obtained by **Gomaa (1991), Hassanein (1995), El-Kalla *et al.* (1999), Zeidan *et al.* (2001) and Ahmed *et al.* (2003).**

Although the interaction between planting date and P fertilization treatments was not significant. Slight differences were shown among the various interaction treatments to give the highest value for seed yield/plant with the interaction of Oct. 29 x Min-II followed by Oct. 29 x Bio-I interaction in 2003/04 season and with the interaction of Nov. 13 x Bio-I + Min-I followed by Nov. 13 x Bio-II + Min-II in 2004/05 season. On the other hand, the lowest values were recorded by the interaction of the control treatment x Oct. 29 planting date during the two seasons.

5. 100-seed weight:

Results in Table (12) indicate that 100-seed weight of faba bean significantly affected by planting date during the two seasons, while P fertilization treatments as well as the interaction between planting dates and P fertilization has no significant effect on 100-seed weight during the two seasons.

A significant effect was shown between all planting dates during 2003/04 season, but in 2004/05 season the significant effect was shown between Nov. 28 planting date compared to Nov. 13 or Oct. 29 planting dates on 100-seed weight. The difference between Oct. 29 and Nov. 13 did not reach the level of significance.

The heaviest 100-seed weight was obtained with the early planting dates being 91.78 g and 88.56 g with Oct. 29 planting date. The next rank was achieved by Nov. 13 planting date which recorded 89.30 and 89.38 g during 2003/04 and 2004/05 seasons, respectively. The highest weight of 100 seeds was obtained by Nov. 28 planting date being 85.22 g and 84.74 g during 2003/04 and 2004/05 seasons, respectively. Similar results were recorded by **McVetty (1986), El-Hurabaa *et al.* (1987a) and Amer *et al.* (1992 and 1997).**

Although P fertilization treatments had no significant effect on 100-seed weight during the two experimental seasons, all plots received P fertilizer slightly increased 100-seed weight compared to the control treatment. The highest values were shown in plots received Bio-II + Min-I during the two seasons followed by Bio-I, Min-II and Bio-I + Min-I in 2003/04 season, and by Min-II and Bio-I + Min-I in 2004/05 season, respectively. **Samia El-Maghraby (1980)** reported similar results, while **Saad and El-Kholy (2000) and Soheir, Mokhtar (2001)** found increase in 100-seed weight with adding P fertilization.

Table (12): 100-seed weight (gm) of faba bean as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	89.925	88.10	83.775	87.267	85.625	87.913	81.90	85.146
Bio-I	92.913	88.85	85.487	89.083	88.05	89.80	84.675	87.508
Bio-II	91.612	88.163	85.987	88.587	88.387	89.95	83.675	87.337
Min. I	92.787	89.125	85.05	88.987	86.90	88.325	83.975	86.40
Min. II	91.962	88.75	86.45	89.054	89.45	91.30	85.40	88.717
Bio-I + Min.-I	93.463	88.687	84.087	88.746	89.025	90.275	86.25	88.517
Bio-I + Min.-II	91.888	90.413	84.712	89.004	89.00	88.75	83.425	87.058
Bio-II + Min.-I	93.162	91.087	83.588	89.279	92.275	88.625	86.825	89.242
Bio-II + Min.-II	88.288	90.462	87.825	88.858	88.35	89.45	86.575	88.125
Mean	91.778	89.2963	85.218	88.763	88.562	89.376	84.744	87.561

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 1.79	= 3.281
Fertilization	(F)	= N.S.	= N.S
Interaction	F. x P.	= N.S	= N.S

Concerning the interaction effect between planting dates and P fertilization treatments on 100-seed weight, data in Table (12) indicate no significant effect. The highest values were recorded by the interaction of Bio-I + Min-I x Oct. 29 followed by Bio-II + Min-I x Oct. 29 in 2003/04 season, and by Bio-II + Min-I x Oct. 29 followed by Min-II x Nov. 13 in 2004/05 season. While the lowest values for 100-seed weight were obtained by Bio-II + Min-I x Nov. 28 during 2003/04 season and by the control x Nov. 28 during 2004/05 season.

6. Seed yield (kg/fed):

As shown from results in Table (13), both planting dates and P fertilization treatments significantly affected faba bean seed yield/fed during the two growing seasons, while the interaction between the two mentioned factors has no significant effect on seed yield/fed

The greatest seed yield/fed was achieved by Nov. 13 planting date during the two seasons and significantly differed compared to Nov. 28 during 2003/04 season and both Oct. 29 or Nov. 28 during 2004/05 season. The next rank in seed yield was obtained by Oct. 29 during 2003/04 season, while in 2004/05 season the next rank was recorded by Nov. 28 planting date. The difference between Oct. 29 and Nov. 28 reached the level of significance.

The increase in seed yield/fed estimated by 6.79% and 1.93% with Nov. 13 planting date compared to Nov. 28 and Oct. 29 planting dates during the first season respectively, being 6.65% and 20.7% during the second one.

Table (13): Seed yield (kg/fed) of faba bean as affected by planting dates, and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	1920.00	2055.0	1962.50	1979.17	1804.25	2108.25	1908.25	1940.25
Bio-I	2173.25	2150.0	1981.25	2101.50	1850.25	2156.00	2146.25	2050.83
Bio-II	2096.25	2146.25	2025.0	2089.17	1823.25	2233.75	2150.25	2069.08
Min. I	2055.00	2195.0	2075.25	2108.42	1867.25	2213.75	2022.5	2034.5
Min. II	2277.50	2302.50	2003.75	2194.58	1856.25	2282.5	2141.25	2093.33
Bio-I + Min.-I	2073.25	2190.0	2105.0	2122.75	1893.25	2288.25	2115.0	2098.83
Bio-I + Min.-II	2162.50	2090.0	2015.0	2089.17	1820.75	2240.0	2090.5	2050.42
Bio-II + Min.-I	2075.0	2125.0	1995.0	2065	1824.00	2238.75	2071.25	2044.67
Bio-II + Min.-II	2225.0	2171.25	2028	2141.42	1831.00	2238.5	2108.0	2059.17
Mean	2117.53	2158.33	2021.19	2099.02	1841.14	2222.19	2083.69	2049.01

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 84.776	= 81.52
Fertilization	(F)	= 78.466	= 66.19
Interaction	F. x P.	= N.S	= N.S.

The superiority of Nov. 13 planting date for increasing seed yield/fed, may be due to its role in increasing number of pods/plant, pods yield/plant, seed yield/plant and 100-seed weight. The results agree with those obtained by **Amer (1986), Amer *et al.* (1997), and Abuldahab *et al.* (2002)**

Regarding the effect of P fertilization treatments, data in Table (13) indicate a significant difference between all plots received P fertilization and the control during the two experimental seasons.

The single application of P fertilization as a mineral or biological form slightly increased seed yield/fed as the rate increased during the two seasons, but in 2003/04 season, the increase in seed yield was true as mineral P rate increased.

On the other side, the effect of P fertilization treatments on seed yield/fed was similar being in a single or combined application. The highest seed yield/fed (2194.6 kg) was obtained by using Min-II P fertilization followed by Bio-II + Min-II which recorded 2141.4 kg/fed in 2003/04 season. In 2004/05 season, the highest seed yield (2098.89 kg/fed) was achieved by the application of Bio-I + Min-I followed by Min-II which recorded 2093.3 kg/fed.

The superiority of P application as Min-II in 2003/04 and 2004/05 seasons may be due to its good effect on number of pods/plant, pods yield/plant, seed yield/plant and 100-seed weight. Such results are in agreement with those reported by **Abou-Salama and Dawood (1994), Shahein *et al.* (1995), Hussein *et al.* (1997), Ghizaw (1999), Saleh *et al.* (2000), Yakout *et al.* (2001), El-Douby and Samia Mouhamed (2002), Ahmed *et al.* (2003) and Knany *et al.* (2004).**

Although, the effect of interaction between planting dates and P fertilization didn't reach the level of significance (Table, 13), plots planted on Oct. 29 and received no P fertilization recorded the lowest seed yield/fed during the two seasons, but those planted on Nov. 13 and received 30 kg P_2O_5 (Min-II) during the two seasons or 300 g biological P + 15 kg P_2O_5 (Bio-I + Min-I) during 2004/05 season gave the highest seed yield.

7. Straw yield (kg/fed):

Faba bean straw yield was significantly affected by planting date and P fertilization during the two successive seasons (Table, 14). Interaction of the two mentioned factors did not significantly affect straw yield.

Results in Table (14) indicate significant differences among all planting dates in straw yield during 2003/04 and 2004/05 seasons. A gradual increase was noticed as planting date become more early from Nov. 28 to Oct. 29. The highest straw yield (3033.4 and 2365.4 kg/fed) was achieved by the early planting date Oct. 29 during the two seasons respectively, whereas delaying planting date to Nov. 28. resulted in a lower straw yield (1919.3 and 2017.1 kg/fed) than the early date (Oct. 29) or medium one (Nov. 13) during the two seasons.

The increment in straw yield may be due to the increase in plant height and number of branches/plant which recorded high values with the same treatments. Similar results were obtained by **Noeman (1989), Bakheit *et al.* (2001) and Abuldahab *et al.* (2002).**

Table (14): Straw yield (kg/fed) of faba bean as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons	2003/04				2004/05			
Planting date / P. Fert.	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	2860.0	2426.50	1816.50	2367.66	2212.5	2093.29	1890.0	2065.25
Bio-I	2976.75	2637.50	1951.25	2521.83	2377.5	2175.75	2047.50	2200.25
Bio-II	3153.75	2603.75	1895.00	2550.83	2256.5	2267.0	2196.5	2240.00
Min. I	3120.00	2692.50	1935.00	2582.50	2351.25	2283.75	2026.5	2220.50
Min. II	3137.50	2597.50	1895.0	2543.33	2467.5	2261.25	2108.75	2279.16
Bio-I + Min.-I	3127.50	2568.75	1957.5	2551.25	2375.0	2293.75	2096.5	2255.08
Bio-I + Min.-II	2975.00	2596.50	2006.50	2526.0	2465.0	2190.0	2008.25	2221.08
Bio-II + Min.-I	2937.50	2525.00	1819.00	2427.16	2408.75	2211.25	2141.25	2253.75
Bio-II + Min.-II	3012.50	2628.75	1997.50	2546.25	2375.0	2300.0	1908.25	2194.41
Mean	3033.38	2586.30	1919.25	2512.98	2365.44	2230.66	2047.05	2214.38

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 153.328	= 97.962
Fertilization	(F)	= 102.474	= 104.324
Interaction	F. x P.	= N.S	= N.S

Straw yield significantly increased by P fertilization treatments compared to the control during the two experimental seasons, except Bio-II + Min-I in 2003/04 season, (Table, 14).

Application of biological or mineral P fertilizer as a single or combined application has similar effect on straw yield. Raising P rate either in a single or combined application has the same effect. A slight increase was recorded by increasing biological or mineral P rate. The highest straw yield was shown with Min-I (2582.5 kg/fed) followed by Bio-I + Min-I (2551.3 kg/fed) in 2003/04 season and with Min-II (2279.2 kg/fed) followed by Bio-I + Min-I (2255.1 kg/fed) in 2004/05 season. The increase in straw yield by such P treatments may be due to their good effect in increasing plant height and number of branches/plant. Many investigators obtained similar results **(Gomaa, 1991; Hassanein, 1995; Hussein *et al.*, 1997; Bahr, 1997; Zeidan *et al.*, 2001 and Ahmed *et al.*, 2003).**

The interaction between planting date and P fertilization on straw yield didn't reach the level of significance during the two growing seasons, however the highest value (3153.8 kg/fed) was recorded by the interaction between Oct. 29 and Bio-II during 2003/04 season and by the interaction of Oct. 29 x Min-II (2467) during 2004/05 season. The lowest values were shown in plots planted on Nov. 28 and received no P fertilization being 1816.5 and 1890.0 kg/fed during the first and second seasons, respectively.

8. Biological yield (kg)/fed):

Data in Table (15) indicate a significant effect for planting dates and P fertilization on faba bean biological yield during 2003/04 and 2004/05 seasons. The interaction between the two mentioned factors has no significant effect on the same trait during the same experimental seasons.

Results show that planting faba bean on the two early dates Oct. 29 during 2003/04 season or Nov. 13 during 2004/05 season gave the highest biological yield which reached 5150.9 and 4452.9 kg/fed, respectively, and significantly differed compared to the other two planting dates during every season. The late planting date (Nov. 28) gave the lowest biological yield (3940.4 and 4130.8 kg/fed) during the two experimental seasons compared to other planting dates. The superiority of the two early planting dates in increasing biological yield is due to their positive role in increasing straw yield/fed firstly and seed yield/fed in consequence

Phosphatic fertilization treatments significantly increased biological yield/fed of faba bean during the two seasons compared to the control treatment (unfertilized plots) (Table, 15).

The highest value of biological yield (4737.9 and 4372.5 kg/fed) was achieved by plots received the higher dose of mineral P during the two seasons, respectively.

The application of P fertilization as biological on mineral form either in the low or high rate did not significantly differ in their effect on biological yield in spite of the slight increment accompanied with higher rates. On the other hand all plots received P fertilization in any form or in combination with different rates didn't show a significant difference in biological yield as compared with the other, except with Bio-II + Min-I treatment in 2003/04 season when compared with Bio-II, Min-I, Min-II, Bio-I + Min-II and Bio-II + Min-II treatments.

Table (15): Biological yield (kg/fed) of faba bean as affected by planting dates, and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	4780.0	4481.50	3779.0	4346.83	4016.75	4201.5	3798.3	4005.5
Bio-I	5150.0	4787.50	3932.50	4623.33	4227.75	4331.75	4193.8	4251.08
Bio-II	5250.0	4750.0	3920.0	4640.0	4079.75	4500.7	4346.8	4309.08
Min. I	5175.0	4887.50	4010.25	4690.917	4218.5	4497.5	4049.0	4255.0
Min. II	5415.0	4900.0	3898.75	4737.917	4323.7	4543.7	4250.0	4372.50
Bio-I + Min.-I	5200.75	4758.7	4062.5	4674.0	4268.25	4582.0	4211.5	4353.9
Bio-I + Min.-II	5137.50	4686.5	4021.5	4615.16	4285.7	4430.0	4098.8	4271.50
Bio-II + Min.-I	5012.50	4650.0	3814.0	4492.16	4232.7	4450.0	4212.5	4298.42
Bio-II + Min.-II	5237.50	4800.0	4025.5	4687.66	4206.0	4538.5	4016.3	4253.58
Mean	5150.917	4744.639	3940.444	4612.0	4206.58	4452.86	4130.75	4263.398

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 226.036	= 152.78
Fertilization	(F)	= 137.945	= 133.84
Interaction	F. x P.	= N.S	= N.S

The optimum treatments affected biological yield were Min-II, Min-I and Bio-I + Min-I P fertilization due to their good effect in increasing straw and seed yields/fed. Similar results were obtained by **El-Douby and Samia, Mouhamed (2002).**

Results in Table (15) show that delaying planting date to Nov.-II in plots without P fertilization resulted in a lower biological yield estimated by 3779.0 and 3798.3 kg/fed during 2003/04 and 2004/05 seasons, respectively. On the other hand, plots planted on Oct. 29 and fertilized by 30 kg P_2O_5 during 2003/04 season or that planted on Nov. 13 received 300 g biological P + 15 kg P_2O_5. during 2004/05 season gave the highest increase for biological yield of faba bean which reached 5415.0 kg/fed for the first season and 4582.0 kg/fed for the second one. In spite of such increases the difference between all interaction treatments didn't reach the level of significance.

9. Harvest index:

Harvest index was significantly affected by planting date only whereas, P fertilization and the interaction between P fertilization and planting dates had no significant effect on harvest index during the two experimental seasons, (Table, 16).

Harvest index value significantly increased with delaying planting dates from one date to the next during 2003/04 and 2004/05 seasons, except between Nov. 13 and 28 during 2004/05 season.

The highest values were 51.34% and 50.475% achieved by Nov. 28 planting date during the two seasons, respectively, (Table, 16). An adverse trend was reported by **Sliman (1993)** who found that the early planting date (Oct. 15th) increased harvest index than the late planting dates.

Table (16): Harvest index of faba bean as affected by planting dates, and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	40.164	45.855	51.974	45.997	44.916	50.208	50.252	48.459
Bio-I	42.371	44.902	50.456	45.910	43.886	49.787	51.293	48.322
Bio-II	39.933	45.201	51.669	45.601	44.69	49.619	49.448	47.919
Min. I	39.710	44.8632	51.748	45.44	44.294	49.219	49.916	47.810
Min. II	42.074	46.998	51.424	46.831	42.956	50.262	50.415	47.878
Bio-I + Min.-I	39.881	46.041	51.826	45.916	44.384	49.955	50.272	48.204
Bio-I + Min.-II	42.111	44.606	50.146	45.620	42.501	50.564	50.98	48.015
Bio-II + Min.-I	41.376	45.657	52.306	46.446	43.117	50.305	49.184	47.535
Bio-II + Min.-II	42.477	45.226	50.509	46.071	43.529	49.349	52.511	48.463
Mean	41.121	45.483	51.34	45.981	43.808	49.919	50.475	48.067

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 0.902	= 1.098
Fertilization	(F)	= N.S	= N.S.
Interaction	F. x P.	= N.S	= N.S.

All P fertilization treatments did not significantly affect harvest index values during the two seasons, as shown in Table (16).

The highest harvest index value was recorded by Min-II followed by Bio-II + Min-I P fertilization treatments during the first season, while Bio-II + Min-II followed by the control treatment recording the highest values during the second season. The lowest harvest indices were 45.44% and 47.535% recorded by Min-II in the first season and Bio-I in the second one (Table, 16). **Hassanein (1995)** noticed that harvest index values increased by P application.

Harvest index values were not significantly affected by the interaction of planting dates x P fertilization during the two seasons, (Table, 16). The highest values were obtained by the combination of Nov. 28 planting date x Bio-I + Min-II P fertilization being 50.146% during 2003/04 season and by Nov. 28 planting date x Bio-II + Min-II P fertilization being 52.54% during 2004/05 season. The lowest values of harvest index were 39.71% and 42.501% recorded by the interaction of Oct. 29 planting date x Min-I during 2003/04 season and Oct. 29 planting date x Bio-I + Min-II P fertilization during 2004/05 season, respectively.

III. Seed quality:

1. Seed coat percentage:

Planting dates as well as P fertilization treatments and their interaction significantly affected faba bean seed coat percentage during 2003/04 and 2004/05 seasons, (Table, 17).

The latest and early planting dates exchanged the superiority for increasing seed coat percentage during 2003/04 and 2004/05 seasons, respectively. While Nov. 13 planting date gave the lowest seed coat percentage values during the two seasons.

During 2003/04 season, the significant difference was shown between each planting date and the other but in 2004/05 season, the significant difference was shown between the early planting date (Oct. 29) and the two other planting dates of Nov. (13 and 28). **Amer (1986)** found an increase in seed coat% with delaying planting date to Nov. 28.

Results in Table (17) show a significant effect for P fertilization treatments on seed coat percentage during the two experimental seasons.

The application of P fertilization as mineral or biological form in different doses showed no marked variance on seed coat percentage during the two seasons, except with Bio-II in 2003/04 season which recorded the highest significant value.

The applied P fertilizer being single or in combination at different doses, almost has the same effect on seed coat percentage during the two seasons, but induced increases when compared with the control treatment. The highest percentage (14.219%) was recorded by Bio-II which significantly differed compared with other P treatments except Bio-I + Min-I and Bio-II + Min-I in the first season: but in the second season the highest value (16.137%) was recorded by Bio-II + Min-I which significantly differed compared to all P treatments except Bio-I + Min-I treatment. Similar results, were reported by **Samia, El-Maghreby (1980).**

Table (17): The seed coat percentage of faba bean seeds as affected by planting data, and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons	2003/04				2004/05			
Planting date / P. Fert.	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	13.565	13.288	13.60	13.484	15.118	14.825	14.357	14.767
Bio-I	13.882	13.275	13.732	13.63	15.692	15.053	14.128	14.957
Bio-II	14.275	14.433	13.95	14.219	16.210	14.668	14.692	15.190
Min. I	13.768	12.582	14.35	13.567	15.687	15.350	14.025	15.021
Min. II	13.595	13.27	13.70	13.522	16.710	15.178	14.405	15.431
Bio-I + Min.-I	13.768	13.875	14.122	13.922	16.177	15.390	16.173	15.913
Bio-I + Min.-II	13.467	13.175	14.455	13.699	16.505	14.402	15.823	15.577
Bio-II + Min.-I	13.942	13.768	14.268	13.993	16.327	15.320	16.763	16.137
Bio-II + Min.-II	13.80	13.333	13.665	13.599	16.573	15.485	15.450	15.836
Mean	13.785	13.444	13.983	13.737	16.111	15.074	15.091	15.425

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 0.1698	= 0.2322
Fertilization	(F)	= 0.3101	= 0.4596
Interaction	F. x P.	= 0.5372	= 0.7962

Adding phosphatic fertilizer to leguminous plants encourages the rate of photosynthetic process which guide to increase in the dry matter content of seed. As a result of that, there was an increase in the absolute amount of nitrogen, protein, phosphorus, potassium and carbohydrates.

The highest values of seed coat percentage were recorded by the interaction between planting date of Nov. 28 when plots received Bio-I + Min-II P fertilization during 2003/04 season and Bio-II + Min-I P fertilization during 2004/05 season. On the other hand, the lowest seed coat percentages were recorded in plots received Min-I and planted on Nov. 13 during the first season and Nov. 28 during the second one.

2. Seed cotyledons percentage of faba bean:

Seed cotyledons percentage significantly influenced by planting date, P fertilization and their interaction during the 2003/04 and 2004/05 seasons, (Table, 18).

Nov. 13 planting date was the best to score the highest values (86.545% and 84.815%) for seed cotyledons percentage during the two seasons, and significantly differed compared to other planting dates except Nov. 28 in the second season.

Oct. 29 and Nov. 28 planting dates exchanged the superiority for recording high values after Nov. 13 during the first and second seasons, respectively, where the difference between them was significant. The values of seed cotyledons percentage recorded by Oct. 29 planting date were 86.203 and 83.499 during the two seasons. Whereas Nov. 28 recorded 86.005 and 84.797 during the two seasons. **Noeman (1989)** found no effect on cotyledons % of faba bean as affected by planting dates.

Table (18): Cotyledons percentage of faba bean seeds as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	86.335	86.612	86.30	86.416	83.882	84.175	84.64	84.233
Bio-I	86.118	86.725	86.267	86.370	84.307	84.948	85.87	85.042
Bio-II	85.725	85.567	86.05	85.781	83.79	85.333	85.307	84.810
Min. I	86.233	87.417	85.65	86.433	84.312	84.65	85.975	84.979
Min. II	86.405	86.730	86.30	86.478	83.259	84.823	85.595	84.569
Bio-I + Min.-I	86.233	86.125	85.877	86.070	83.823	84.610	83.828	84.087
Bio-I + Min.-II	86.532	86.825	85.545	86.301	83.495	85.597	84.177	84.423
Bio-II + Min.-I	86.057	86.233	85.733	86.008	83.678	84.68	83.238	83.863
Bio-II + Min.-II	86.200	86.667	86.335	86.401	80.927	84.515	84.55	83.331
Mean	86.203	86.545	86.005	86.251	83.499	84.815	84.797	84.370

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 0.1698	= 0.4602
Fertilization	(F)	= 0.310	= 0.89406
Interaction	F. x P.	= 0.537	= 1.5485

Regarding the effect of P fertilization on seed cotyledons percentage, data in Table (18) show that a significant effect of P fertilization during the two experimental seasons.

It was noticed that plots received lower doses of biological or mineral P recorded higher values for seed cotyledons percentage during the two seasons without significant difference, except between Bio-I and Bio-II during 2003/04 season.

The application of P fertilization in combination at different rates has similar effect as single application.

The highest value of seed cotyledons percentage (86.478%) was recorded by Min-II followed by Min-I (86.433%) in 2003/04 season and by Bio-I (85.042%) followed by Min-I (84.979%) in 2004/05 season. On the other hand, Bio-II and Bio-II + Min-II gave the lowest values during the first and second seasons, respectively. **Samia El-Maghraby (1980)** obtained no significant effect on cotyledons % of faba bean as affected by P fertilization rates up to 64.0 kg P_2O_5/fed.

Seed cotyledons percentage was significantly affected by the interaction between planting date and P fertilization during the two seasons, (Table, 18). Plots fertilized with Min-1 recorded the greatest values when planted on Nov. 13 during 2003/04 season and Nov. 28 during 2004/05 season, being 87.417% and 85.975%, respectively. The lowest values of seed cotyledons percentage were recorded with plots planted on Nov. 28 and received Bio-I + Min-II during 2003/04 season and with that planted on Oct. 29 and received Bio-II + Min-II during 2004/05 season.

3. Phosphorus percentage in faba bean seeds:

Results in Table (19) indicate a significant effect on P % of seeds as affected by planting dates, P fertilization and their interaction during 2003/04 and 2004/05 seasons.

The medium planting date Nov. 13 gave the highest values for P% in seeds and recorded 0.255% in the first season and 0.222% in the second one with a significant difference when compared with the other two planting dates in the first season or Nov. 28 planting date in the second season.

The next treatment for the positive effect on P % in seeds was Oct. 29 which significantly increased the former trait as compared to the late planting date Nov. 28 during the two seasons and recorded values of 0.225% and 0.221%, respectively. **Amer (1986)** obtained increase in seed phosphorus content% as planting date became more early.

All plots received P fertilization significantly increased P % in seeds compared to the unfertilized plots (control) during the two experimental seasons, (Table, 19).

The plots fertilized with biological or mineral P significantly increased P% in seeds as P dose increased during the two seasons.

The application of biological or mineral P being singly or in combination has similar effect in most cases as results indicate during the two experimental seasons.

The highest value for P% in seeds was obtained by Bio-II + Min-I treatment in the first season and by Min-II treatment in the second season, being 0.239% and 0.230%, respectively.

The next treatment for enhancing P % in seeds was Bio-II + Min-II (0.238%) in 2003/04 season and Bio-I + Min-II (0.224%) in 2004/05 season.

The interaction of Nov. 13 planting date x Bio-II + Min-II gave the greatest values for P% in seeds during the two experimental seasons and recorded 0.282% and 0.240%, respectively. The lowest values were recorded by the interaction of Nov. 28 planting date x the control treatment being 0.140% in the first and second seasons.

Table (19): Phosphorus percentage of faba bean (seeds) as affected by planting dates and chemical and biophosphatic fertilization in 2003/04 and 2004/05 seasons.

Seasons / Planting date / P. Fert.	2003/04				2004/05			
	Oct. 29	Nov. 13	Nov. 28	Mean	Oct. 29	Nov. 13	Nov. 28	Mean
Control	0.200	0.230	0.140	0.190	0.203	0.212	0.140	0.185
Bio-I	0.230	0.230	0.150	0.203	0.212	0.210	0.178	0.200
Bio-II	0.237	0.260	0.170	0.222	0.212	0.237	0.190	0.213
Min. I	0.220	0.260	0.180	0.220	0.228	0.212	0.203	0.214
Min. II	0.210	0.280	0.200	0.230	0.230	0.230	0.230	0.230
Bio-I + Min.-I	0.230	0.250	0.178	0.219	0.230	0.210	0.210	0.217
Bio-I + Min.-II	0.230	0.250	0.188	0.223	0.230	0.212	0.230	0.224
Bio-II + Min.-I	0.236	0.250	0.230	0.239	0.212	0.230	0.189	0.211
Bio-II + Min.-II	0.233	0.282	0.200	0.238	0.230	0.240	0.178	0.216
Mean	0.225	0.255	0.182	0.221	0.221	0.222	0.194	0.212

L.S.D.	5%	2003/04	2004/05
Planting date	(P)	= 0.004	= 0.008
Fertilization	(F)	= 0.005	= 0.009
Interaction	F. x P.	= 0.009	= 0.02

IV. Infestation of *Callosobruchus maculates* (F.)

1. Effect of planting dates:

Susceptibility:

Data obtained in Table (20) show that the increase of seed coat percentage caused an increase of progeny emergence and laid eggs. Data show that increase in phosphorus percentage in faba bean seed led to a clear decrease of progeny emergence i.e., 0.221% and 0.212% P total number of progeny of gave 52.72 and 55.02, respectively. Results also indicated that seed coat and phosphorus percentages decreased in the third date compared to the first date.

There is no significant differences between the percent of infestation of first and second date, this means that plant date have no effect on the % infestation at the second date while % infestation significantly increased at the third date compared to first one.

Preferability:

Data obtained in Table (21) show that planting date had higher effect on the laid eggs generally, the second date had the highest seed yield (2190.26 kg/fed) with the lowest adult emergence, laid eggs and % damage.

2. Effect of fertilization:

Different rates of bio and chemical fertilizers were tested in this study to evaluate its effects on number of parameters either in field or storage. The most important of these parameters were of seed yield (kg per fed) and seed infestation.

Data obtained in Table (22) indicated that there were significant differences between control and the all treatments of fertilization. Results cleared that phosphorus percentage of seeds recorded significant increase at all rates of fertilizers.

Certain criteria of determing susceptibility of faba bean seeds were number of laid eggs, % hatched eggs, % damage and % infestation in field. All parameters were significantly increased at all rates of fertilizers compared to control. B_2 and M_2 rates had the highest effect on % infestation with values of 3.11 and 3.75%, respectively over 2.31% for control. The increased susceptibility of faba bean seeds may be due to the altered chemical composition of seeds arising from different rates of fertilizers as shown in Table (23) for phosphorus percentage. There were other physio-chemical factors which were not studied which may be caused the high susceptibility of seeds in addition to the studied parameters. Seed coat percentage had no effect on the factors of resistant of seeds.

3. The interaction between planting dates and type fertilizers:

Data presented in Table (24) show that the bio and chemical fertilization significantly affected faba bean seeds coat percentage of the two studied seasons. The highest seed coat percentage of 14.43 and 16.71 were obtained with B_{2x} the second date and M_{2x} the first date in the first and second season, respectively. While the lowest values of 12.88 and 13.69 were observed with M_{1x} the second date and B_1 in the first date in the first and second season, respectively. Data also show that phosphorus percentage significantly affected by bio and chemical phosphorus fertilization. The highest phosphorus percentage of 0.28% and 0.24% were obtained with M_2B_{2x} the second date in the first and second season, respectively. While, the lowest phosphorus percentage values of 0.141 and 0.14% were recorded with the control treatment in the third date in the first and second season, respectively.

Results of Table (24) show that no significant effects of phosphorus fertilization on damage %, laid of eggs in first season, damage of seeds by choice and field infestation. On the other hand, there was significant effect on total adult emergence progeny and laid of eggs by no choice.

Southgate (1979) studied that certain factors such as seed hardness, small seed size, absence of nutritional factors, and presence of toxic substance, may affect bruchid damage to legume seeds.

Shazali (1989) studied the oviposition and development of *Bruchidius incarnates* and *C. maculatus* on 7 seed legumes in an incubator at 30^{o}C an 70% RH. Both insects failed to develop on hair coat bean and lupin. There was evidence that this was due to seed coat hardness in hair-coat bean and seed chemical composition in lupin.

Zein and Abo-Arab (2000), conducted laboratory experiments to study the degree of infestation by *S.oryzae* and *R. dominica*on two wheat varieties, (Sakha 9 and Sakha 92) priorly treated in the field with bio-organofertilizers (Azotobacter inoculation (of grains) and/or farmyard manure (FYM) treatments, under three levels of nitrogen fertilization or recommended N dose during 1997/98 and 1998/99 seasons. They found that the level and the kind of fertilizer had some effect on the degree of infestation and number of progeny of the two tested insects for the two used wheat varieties.