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EFFECT OF SOWING DATES, PHOSPHORUS FERTILIZATION AND BIOFERTILIZATION ON SEED YIELD OF EGYPTIAN CLOVER (*Trifolium alexandrinum, L.*) UNDER SPRINKLING IRRIGATION SYSTEM

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ABSTRACT

Two field experiments were conducted at the Research Farm of Faculty of Agriculture, Suez Canal University at Al-Ismailia during 2003/2004 and 2004/2005 winter seasons. The present investigation aimed to study the effect of sowing date, different rates of phosphorus fertilization and biofertilization with Phosphoren on seed yield and its attributes of berseem multi-cut (Meskawi) Helaly cv. in sandy soil under sprinkling irrigation system. A split-split plot design with four replicates was used in both seasons.

The results revealed that early sowing date (5th Oct.) increased significantly number of stems/plant, number of heads/ 10 plants, seed weight/10 plants (g) , 1000-seed weight (g), seed and straw yields in both seasons. Concerning seed yield (kg/fad), the superiority of the first sowing date (5th Oct.) over the second (20th Oct.) and the last sowing date (4th Nov.) reached 8.19% and 14.74% in the first season and 11.97% and 18.93% in the second season, respectively.

In general, increasing the levels of phosphorus increased significantly seed yield and its attributes. Applying P fertilizer up to 31.0 and 46.5 kg P2O5/fad to clover plants increased seed yield about 19.79 and 26.12% in the first season and about 20.20 and 26.28% in the second season, respectively, compared with 15.5 kg P2O5/fad.

Phosphoren had significant favorable effects on all traits. Seed yield Kg/fad and straw yield ton/fad increased significantly by 5.84 and 5.72% in 2003/2004 and by 6.39 and 6.93% in 2004/2005 seasons, respectively, compared with untreated plants.

The treatment combination of 46.5 kg P2O5/fad and Phosphoren increased significantly seed yields by 31.92 and 32.77% in 2003/2004 and 2004/2005 seasons, respectively, in comparison with treatment combination of 15.5 kg P2O5/fad and without Phosphoren.

Seed yields in both seasons were positively and highly significantly correlated with number of stems/plant, number of heads/10 plants, seed weight/10plants (g), 1000-seed weight(g), specific seed weight, seed and straw yields.

Path analysis of both seasons showed that seed weight/ 10 plants (g) and its interaction with 1000-seed weight (g) and number of heads/ 10 plants were the main source of yield variation. The direct effects were 37.49, 25.37 and 11.69% in the first season and were 25.25, 21.96 and 16.52% in the second season, respectively,.

INTRODUCTION

Egyptian clover is the most important forage crop for irrigated areas in Egypt. It plays a vital role in the sustainability of agriculture. It is an

excellent plant for suppressing and controlling devastating weeds. It is an environmentally friendly crop where minimum or no pesticides are used. It is the major seed export crop (more than 12000 tones) and it occupies about one third of the cultivated area in Egypt (between two to three millions fad) as full-season and short–season crop as well as area devoted to seed production during winter (El-Nahrawy, 2005). The total seed production is about 300000 ardabs, with an average of about 1.2 ardab/fad which is, clearly, very low. This is one of the main problems that confront berseem production in Egypt. As expected, some of the factors affecting seed yield are sowing date and, also, phosphorus fertilization and biofertilization.

Respecting the effect of sowing date on seed yield and its quality, many investigators in different locations in Egypt indicated the optimum sowing date (from 1st to 15th Oct.) that gave the highest seed production. Gaballah (1996) found that early planting (1st or 15th Oct.) increased number of stems/plant, seed and straw yields compared to later planting (1st and 15th Nov.). Mohamed (1986) reported that the number of shoots/plant were, also, higher at the first sowing date (5th Oct.) compared with 20th Oct. and 5th Nov. In the same direction, Attaran (1991) found that early sowing increased seed yield (maximum 0.92t/ha) compared with later sowing. Moreover, Taneja *et al* (1994) noticed that delaying sowing of Egyptian clover decreased nodulation and N content of nodules/plant and as a result of that, seed yield and its attributes were decreased. Meanwhile, in India, Tiwana and Bhullar (1987) found that the maximum seed yield of berseem (0.49 t/ha) was obtained from the crop sown in the 1st week of Nov. compared with 0.28 t from the crop sown in the 1st week of Feb. Kandil (1978), also, investigated the influence of three planting dates i.e mid-August, mid-September and mid-October on berseem seed yield. He reveled that when planting was early, number of stems/plant, number of heads/plant, specific gravity and straw and seed yields/fad were significantly increased. Taneja *et al* (1991) and Barik and Mukherjee (1990) showed that seed yield of Egyptian clover decreased when sowing date was later than 15th or 20th December, respectively. On the other hand, Gaballah (1996) did not find any effect of sowing date on number of heads/m2, 1000-seed weight and specific seed weight. Moreover, Singh(1979) showed that berseem seed yield was not affected much by sowing dates, but delaying sowing dates resulted in an increase in number of heads/plant (Kandil, 1973).

Regarding the effect of phosphorus fertilization on yield and its attributes, Marchener (1995) and Prasad and Power (1997) reported that phosphorus involved in energy transfer process in both photosynthesis and respiration. This, in turn, increased the amount of metabolites translocated from the source to sink. Tawfiq and Mohamed (1988) indicated that increasing P rates from 0 to 180kg P_2O_5/ha increased significantly berseem yield and 1000-seed weight. Also, Robtsov and Madatov (1991) noticed that seed yield of berseem was increased by 31.6% due to addition of 60kg P_2O_5/ha. In the same direction, Taneja *et al* (1991) concluded that berseem seed yield was the highest when 75 kg P_2O_5/ha was applied. Compared with unfertilized check plots, the number of heads/m^2, seed and straw yields/fad were significantly increased by application of 15.5 or 31.0 kg P_2O_5/fad

(Gaballah, 1996). Moreover, Gaballah (2001) noticed that number of stems/plant, specific seed weight, straw and seed yields and their attributes were significantly increased by increasing P rates from 15.5 to 46.5 kg P_2O_5/fad. Virender-Sardana and Narwal (1999) reported that the application of 80 P_2O_5/ha significantly increased the fodder and seed yields of Egyptian clover over control. In addition, Nadian *et al* (2005) reported that the dry mass of shoots and roots were significantly increased by phosphorus application to Egyptian clover.

On the other hand, Singh (1979) found that application of 120 kg P_2O_5/ha had no significant effect on seed production. Also, Aly (1989) reported that the differences among these phosphorus rates (0, 15.5 and 31.0 kg P_2O_5/fad) applied to berseem were not significant. In the same direction, Gaballa (1996) indicated that the phosphorus did not exert any significant effect on specific seed weight and 1000-seed weight (g).

Application of biofertilizers increases the efficiency of the soil on the gains of total nitrogen and organic carbon, improvement of water stable aggregates and stimulation of CO_2 evolution and microbiological counts, i.e. total bacteria, fungi, actinomycetes and aerobic cellulose decomposers (Hashem, 1999). Also, Verma and Mouli (1995) reported that biofertilizers enhanced nitrogen fixation (symbiotic systems, nodule-forming; symbiotic systems, non nodule-forming; non-symbiotic systems), phosphate solubilizers, and organic matter decomposers. On the other hand, El-Akabawy (2000) revealed that phosphorine (P-dissolving bacteria) could compensate the plant with more than half the recommended rates of the mineral nitrogenous and phosphatic fertilizers and as a result of that, it improved the yield and its quality of Egyptian clover [Trifolium alexandrinum]. In the same direction, Hashem and Wassif (1999) showed that biofertilizer, either in the form of non-symbiotic nitrogen fixing bacteria (Nb) or phosphate dissolving bacteria (Pb), individually or in combination of both had significant effects on nitrogenase activity and clover production. Also, seed inoculation of Egyptian clover with biofertilizer (phosphate solubilizer bacteria) produced significantly higher yields over the uninoculated control (Sharma and Agrawal, 2003). Moreover, pod yield of Faba bean, i.e. number of pods, average pod weight and green pod yield, were highest with phosphorene (1 kg/fed) combined with 200 kg superphosphate/fed (Abdalla, 2002).

The main goal of the present investigation was to study the effect of sowing date, different rates of phosphorus fertilization and biofertilization with phosphoren on seed yield and its attributes of berseem (*Trifolium alexandrinum,L.*).

MATERIALS AND METHODS

The present investigation was carried out at the Research Farm of Faculty of Agriculture, Suez Canal University at Al-Ismailia during 2003/2004 and 2004/2005 seasons. This investigation aimed to study the effect of sowing date, phosphorus fertilizer rates and biofertilization with Phosphoren on seed yield and its attributes of berseem multi-cut Meskawi (Helay cv) in

sandy soil under sprinking irrigation system. The soil texture of experimental field was sandy with pH of 8.09. The available N, P and K were 15.3, 3.8 and 85 ppm, respectively.

A split-plot plot design with four replications was used in both seasons. Three sowing dates (5th Oct., 20th Oct. and 4th Nov.) occupied the main plots. Three phosphorus fertilization levels (15.5, 31.0 and 46.5 Kg P_2O_5/fad) were distributed at random in the sub-plots. While, the sub-sub plots (3x3.5m) were occupied by two biofertilzation treatments (untreated and treated with Phosphoren). The biofertilization treatment was added at sowing in both seasons. The treatments of phosphorus fertilization in the form of calcium superphosphate (15.5% P_2O_5) was added in three equal doses (at sowing, after the 1st cut and after the 2nd cut).

Seeds of Helaly cv. were broadcasted at the rate of 30kg/fad. The preceding crop was fallow and peanut in the first and second seasons, respectively. Berseem was twice cut in each season after 60, 105 from sowing. Then, seed yield was obtained from the third cut. At harvest, a sample of ten plants was taken at random from each plot and the following measurements were recorded:

1- Number of stems/plant.
2- Number of heads/ 10 plants.
3- Seeds weight/10 plants (g).
4- 1000-seed weight (g).
5- Specific seed weight (1000-seed weight in g ÷ 1000-seed volume in cm^3)

The 1000-seed volume was determined by submerging the seeds in xylol.

An area of two square meters was harvested at random from each plot to calculate:

6- Seed yield (kg/fad).
7- Straw yield (ton/fad).

All data were statistically analyzed according to the method described by Snedecor and Cochran (1967). Significant differences among means were judged with the help of Duncan's multiple range test (Duncan, 1955). Also, simple correlation coefficients and path analysis were calculated as described by Svab (1973).

RESULTS AND DISCUSSIONS

1- Effect of sowing date:

According to the data of the first and second seasons (Table 1), it is clear that delaying sowing significantly decreased number of stems/plant, number of heads/ 10 plants, seeds weight/10 plants (gm), 1000-seed weight (gm), seed yield (kg/fad) and straw yield (ton/fad). Meanwhile, sowing date had no significant effect on specific seed weight in both seasons. In the same direction, Gaballah (1996) also found that sowing dates had no significant effect on specific seed weight. It is interesting to note that the first sowing date (5th Oct.) gave the highest values with all characters compared with the last sowing date (4th Nov.) which gave the lowest values.

Table (1): Seed yield and its attributes of berseem as affected by sowing dates, phosphorus fertilization levels and biofertilization during 2003/2004 and 2004/2005 seasons

Main effect and interaction	No.of stems/plant		No. of heads/10plant		Seeds weight/ 10plants (g)		1000-seed weight (g)		Specifics seed weight		Seed yield kg/fad		Straw yield ton/fad	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Sowing dates (S)														
5th October	7.70a	8.06a	185.58a	192.75a	11.66a	12.21a	2.590a	2.683a	0.848a	0.860a	228.24a	239.91a	1.328a	1.390a
20th October	7.24b	7.67a	171.75b	180.13b	10.59b	11.32b	2.442b	2.495b	0.831a	0.842a	210.96b	214.26b	1.191b	1.259b
4th November	6.68c	7.01b	159.33c	165.67c	10.02c	10.54c	2.334c	2.398c	0.814a	0.830a	198.92c	201.72c	1.099c	1.156c
F-test	***	**	***	***	**	***	***	***	N.S	N.S	***	***	***	***
phosphorus levels (P)														
15.5kg P_2O_5/fad	6.27c	6.54c	163.29b	168.54b	7.99c	8.67c	2.231c	2.275c	0.779b	0.790c	184.48c	189.30c	1.080b	1.131b
31.0kg P_2O_5/fad	7.49b	7.91b	173.96a	182.08a	11.24b	11.87b	2.525b	2.610b	0.846a	0.857b	220.99b	227.54b	1.251a	1.317a
46.5kg P_2O_5/fad	7.87a	8.30a	179.42a	187.92a	13.05a	13.52a	2.610a	2.691a	0.869a	0.885a	232.66a	239.05a	1.287a	1.357a
F-test	***	***	***	***	***	***	***	***	***	***	***	***	***	***
Biofertilization (B)														
Untreated	6.89b	7.14b	158.56b	166.83b	10.20b	10.82b	2.416b	2.478b	0.806b	0.821b	206.68b	211.86b	1.172b	1.226b
Treated	7.53a	8.02a	185.89a	192.19a	11.33a	11.89a	2.494a	2.573a	0.856a	0.867a	218.74a	225.40a	1.239a	1.311a
F-test	***	***	***	***	***	***	*	***	***	*	***	***	***	***
Interaction														
SxP	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
SxB	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
PxB	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	*	*	N.S	N.S
SxPxB	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

The results of the second season indicated that the differences between the first and second sowing date were not significant in number of stems/plant. Concerning seed yield, the superiority of the first sowing date (5th Oct.) over the second (20th Oct.) and the last sowing date (4th Nov.) reached 8.19% and 14.74% in the first season and 11.97% and 18.93% in the second one, respectively. These results are in a good connection with those reported by Gaballah (1996), Taneja *et al* (1994), Attaran (1991), Taneja *et al* (1991) Barik and Mukherjee (1990) and Mohamed (1986). On the other hand, Gaballah (1996) found that sowing date had no significant effect on number of heads/m^2, 1000-seed weight. Moreover, Singh (1979) showed that berseem seed yield was not affected much by sowing dates, but delaying sowing dates resulted in an increase in number of heads/plant (Kandil, 1973).

2- Effect of phosphorus fertilization:

It is evident from Table (1) that adding P fertilizer at the rate of 31.0 and 46.5 kg P_2O_5/fad resulted in high significant increments respecting all characters under study i.e. number of stems/plant, number of heads/ 10 plants, seed weight/10 plants (g), 1000-seed weight (gm), specific seed weight, seed yield (kg/fad) and straw yield (ton/fad) in both seasons compared with 15.5 kg P_2O_5/fad. The maximum values with all characters were obtained due to application of 46.5 kg P_2O_5/fad. But, there were no significant differences between 31.0 and 46.5 kg P_2O_5/fad on the number of heads/10 plants and straw yield ton/fad in both seasons. Also, there were no significant differences between these doses on specific seed weight in the first season. Regarding the effect of P fertilizer on seed yield (Figure 1), the results show that applying P fertilizer upto 31.0 and 46.5 kg P_2O_5/fad to clover plants increased seed yield with 19.79 and 26.12% in the first season as well as 20.20 and 26.28% in the second season, respectively, compared with 15.5 kg P_2O_5/fad. Such favorable effects of phosphorus fertilization on seed yield and its attributes might be attributed to improved activity of soil bacteria in fixing atmospheric nitrogen and enhancing root growth (Singh, 1979 and Abd El-Latif, 1986). Also, phosphorus plays an important role in energy transfer processes in photosynthesis and respiration. It is a component of phospholipids and is required in large amounts for reproductive organs (Prasad and Power, 1997). These results are in agreement with those reported by Tawfiq and Mohamed (1988), Robtsov and Madatov (1991), Taneja *et al* (1991), Virender-Sardana and Narwal (1999), Gaballa (2001) and Nadian *et al* (2005).

3-Effect of Phosphoren:

Biofertilization with Phosphoren had significant favorable effects on the traits of number of stems/plant, number of heads/ 10 plants, seed weight/ 10 plants (gm), 1000-seed weight (gm), specific seed weight, seed yield (kg/fad) and straw yield (ton/fad) in both seasons compared with untreated plants. That was true in both seasons (Table 1). Seed yield (Kg/fad) and straw yield (ton/fad) increased significantly by 5.84 and 5.72% in 2003/2004 and by 6.39 and 6.93% in 2004/2005, respectively, compared with untreated plants (Figure 2). Furthermore, (Figure 3) showed that biofertilization with Phosphoren increased significantly seed yield components i.e. number of

heads/ 10 plants, seed weight/ 10 plants (g) and 1000-seed weight (g) by 17.24%, 11.08% and 3.23% in 2003/2004 and by 15.20%, 9.89% and 3.83% in 2004/2005, respectively, in comparison with untreated plants.

The increased seed yield and its attributes due to application of Phosphoren might be attributed to that Phosphoren enhanced nitrogen fixation, microbiological counts, phosphate solubilizers and organic matter decomposers (Verma and Mouli, 1995 and Hashem, 1999).

Figure 1: Relative percentage of increase in seed yield due to application of different levels of phosphorus compared to 15.5kg P_2O_5/fad

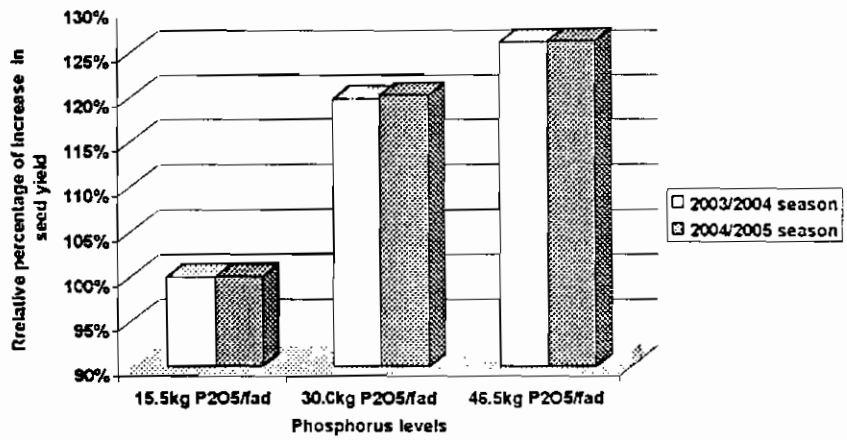


Figure 2: Relative percentage of increase in seed and straw yields due to addition of Phosphoren compared to untreated plants

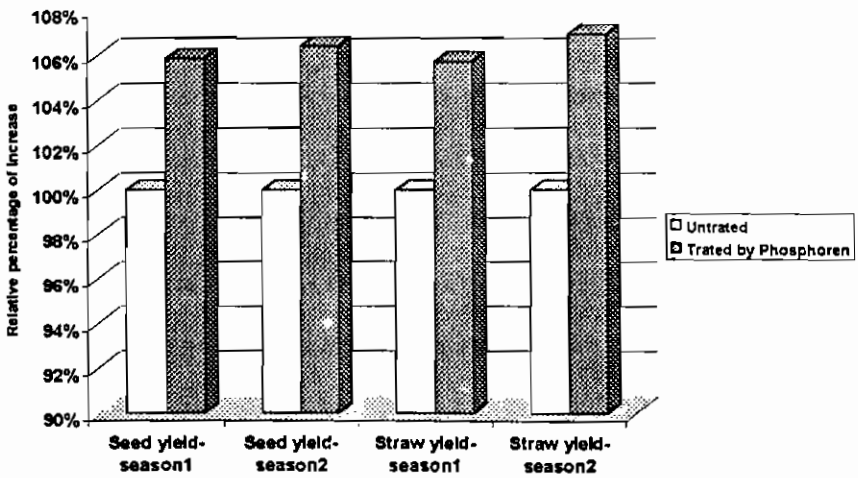
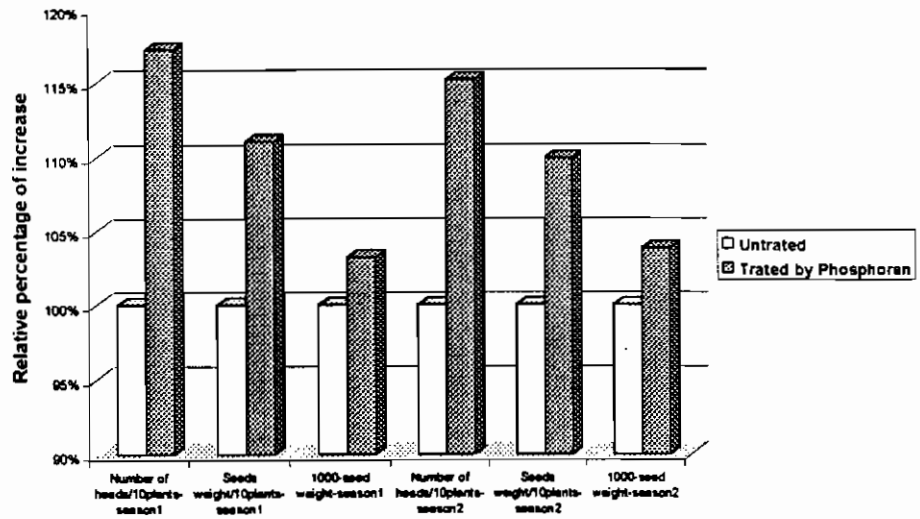


Figure 3: Relative percentage of increase in seed yield components due to addition of Phosphoren compared to untreated plants



Moreover, Phosphoren (P-dissolving bacteria) could compensate the plant with more than half the recommended rates of the mineral nitrogenous and phosphatic fertilizers and as a result of that it improved the yield and its attributes of Egyptian clover (El-Akabawy, 2000). These results are in accordance with those obtained by Hashem and Wassif (1999) and Sharma and Agrawal (2003).

4-Interaction effects

Except the interaction between phosphorus and Phosphoren on seed yield in both seasons, the interactions between or among the three studied factors (sowing date, phosphorus and Phosphoren) did not reach the 5% level of significance on seed yield and its attributes in both seasons (Table 1). This indicates that each of the two or three studied factors affected seed yield of berseem and its attributes, independently.

Table (2) illustrates that the highest values of seed yields were obtained due to the treatment combination of 46.5 kg P_2O_5/fad and Phosphoren. This treatment combination gave 237.90 and 246.61 kg/fad in 2003/2004 and 2004/2005, respectively. While, the minimum values were obtained from the treatment combination of no Phosphoren and 15.5 kg P2O5/fad which gave 180.34 and 185.75 kg/fad in the first and second seasons, respectively. Table (2) illustrates, also, the interaction between 46.5 kg P2O5/fad and Phosphoren which increased significantly seed yields by 31.92 and 32.77% in 2003/2004 and 2004/2005, respectively, in comparison with the interaction between the untreated plants with Phosphoren and 15.5 kg P_2O_5/fad. The treatment combination of 46.5 kg P_2O_5/fad and no Phosphoren and that of 31.0 kg P_2O_5/fad and with Phosphoren had the same effect on seed yield in both seasons.

Table (2): The effect of Phosphoren application and different levels of phosphorus on seed yield (kg/fad) in 2003/ 2004 and 2004/2005 seasons

Interaction		Seasons	
Phosphorus levels	Phosphoren	2003/2004	2004/2005
15.5kg P2O5/fad	Untreated	180.34e	185.75e
	Treated	188.62d	192.85d
31.0kg P2O5/fad	Untreated	212.28c	218.33c
	Treated	229.71b	236.75b
46.5kg P2O5/fad	Untreated	227.43b	231.49b
	Treated	237.90a	246.61a
RI%		31.92%	32.77%

RI%: Relative percentage of increase in seed yield due to application of 46.5 kg P2O5/fad with Phosphoren in comparison with 15.5kg P2O5/fad and without Phosphoren

These results indicte that Phosphoren played an important role to enhance nitrogen fixation, phosphate solubilizers, organic matter decomposers. Moreover, El-Akabawy (2000) revealed that Phosphoren could compensate the plant with more than half the recommended rates of the mineral nitrogenous and phosphatic fertilizers and as a result of that, it improved the seed yields in both seasons of Egyptian clover.

5-Yield analysis:

5-1- Correlation studies:

The results of simple correlation coefficients between seed yield/ (kg/fad) and its attributing characters during 2003/2004 and 2004/2005 seasons are presented in Tables (3 and 4). It is evident from these Tables that seed yields in the first and second seasons were positively and highly significantly correlated with number of stems/plant, number of heads/10 plants, seed weight/10plants (g), 1000-seed weight (g), specific seed weight, seed and straw yield per fad. These correlations between seed yield and its components (number of heads/10 plants, seed weight/10plants and 1000-seed weight) were (r= 0.6660, 0.91491 and 0.84702 in 2003/2004 and r = 0.74487, 0.88540 and 0.87430 in 2004/2005, respectively). In both seasons, it is evident that increased seed yield resulted due to the increase of all seed yield components which, according to the present results, seemed to be positively correlated (Tables 3 and 4). These results are in accordance with those obtained by Radwan et al (1983), Geweifel and Rammah (1990) and Gaballah (2001).

5-2- Path analysis:

The method of path coefficient was used to analyze the yield components of number of heads/ 10 plants, seed weight/ 10 plants (g) and 1000-seed weight (g). Moreover, path analysis was practiced in order to find out the relative importance of these characters in contributing seed yield of berseem. The results obtained from Table (5) show that the seed weight/ 10 plants (g) and its interaction with 1000-seed weight and number of heads/ 10 plants greatly affected the seed yield variation. The direct effects were 37.49, 25.37 and 11.69% in 2003/2004 and were 25.25, 21.96 and 16.52% in 2004/2005, respectively.

Table (3): Simple correlation coefficients between seed yield (kg/fad) of Egyptian clover and its attributes during the first season

	1	2	3	4	5	6
Y-Seed yield (kg/fad)	0.87984**	0.66600**	0.91491**	0.84702**	0.70784**	0.91245**
Number of stems/plant	-	0.68095**	0.82447**	0.77527**	0.67435**	0.82922**
Number of heads/10plants		-	0.58924**	0.56779**	0.51110**	0.65745**
Seeds weight/10plants			-	0.82102**	0.69335**	0.78450**
1000-seed weight (g)				-	0.58161**	0.77229**
Specific seed weight					-	0.64753**
Straw yield (ton/fad)						-

Table (4): Simple correlation coefficients between seed yield (kg/fad) of Egyptian clover and its attributes during the second season

	1	2	3	4	5	6
Y-Seed yield (kg/fad)	0.82942**	0.74487**	0.88540**	0.87430**	0.59860**	0.88028**
Number of stems/plant	-	0.68593**	0.81216**	0.76398**	0.54130**	0.75856**
Number of heads/10plants		-	0.57925**	0.66569**	0.42236**	0.69615**
Seeds weight/10plants			-	0.85579**	0.64307**	0.78897**
1000-seed weight (g)				-	0.52238**	0.80307**
Specific seed weight					-	0.54823**
Straw yield (ton/fad)						-

Table (5): Direct and joint effects of seed yield components presented as percentages of yield variation of Egyptian clover in 2003/2004 and 2004/2005 seasons.

Source of variation	Coefficient of determination	Percentage contribution	Coefficient of determination	Percentage contribution
	2003/2004 season		2004/2005 season	
Number of heads/10plants	0.0262	2.62	0.0805	8.05
Seeds weight/10plants (g)	0.3749	37.49	0.2525	25.25
1000-seed weight (g)	0.0637	6.37	0.0652	6.52
Number of heads/10plants X Seed weight/10plants (g)	0.1169	11.69	0.1652	16.52
Number of heads/10plants X 1000-seed weight (g)	0.0464	4.64	0.0965	9.65
Seeds weight/10plants X 1000-seed weight (g)	0.2537	25.37	0.2196	21.96
R2	0.8818	88.18	0.8795	87.95
Residual	0.1182	11.82	0 1205	12.05
Total	1.0000	100.00	1 0000	100 00

It is worthy to note that, the yield components recorded herein, especially seed weight/10plants contributed as much in seed yield, as R^2 reached about 88.17 and 87.95% of the total yield variation in both seasons, respectively. While, the residual effect of the other seed yield components was about 11.82 and 12.05% in both seasons, respectively. This residual variation could be attributed to other yield contributing characters such as number of stems/plant. Contrary, Geweifel and Rammah (1990) and Gaballah (2001) found that the number of heads/plant and its interaction with seed weight/plant greatly affected the seed yield variation.

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تأثيرمواعيد الزراعة والتسميد الفوسفاتي والتسميد الحيوي على محصول البـذرة في البرسيم المصري تحت نظام الري بالرش

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أقيمت تجربتان حقليتان بمزرعة التجارب الزراعية-كلية الزراعة-جامعة قناة السويس بالإسماعيلية خلال موسمي٢٠٠٣/٢٠٠٤، ٢٠٠٤/٢٠٠٥ لدراسة تأثير مواعيد الزراعة ومستويات مختلفة من التسميد الفوسفاتي والتسميد الحيوي بالفوسفورين على محصول البذرة ومساهماته في البرسيم المصري المسقاوى بالاراضى الرملية تحت نظام الري بالرش فى تصميم قطع منشقة مرتين فى أربعة مكررات.

أهم النتائج المتحصل عليها يمكن تلخيصها في الاتى:

أدى ميعاد الزراعة المبكر (٥ أكتوبر) إلى زيادة معنوية فى عدد السيقان/نبات وعدد النورات/١٠نباتات ووزن البذور/١٠نباتات ووزن ١٠٠٠ بذرة (جرام) ومحصول القش والبذور/فدان خلال الموسمين. وبالنسبة لمحصول البذرة فقد تفوق ميعاد الزراعة الأول (٥ أكتوبر) عن الميعاد الثاني (٢٠ أكتوبر) والميعاد الثالث (٤ نوفمبر) حوالي ٨,١٩% و١٤,٧٤% فى الموسم الأول وحوالي ١١,٩٧% و١٨,٩٣% فى الموسم الثاني على الترتيب.

بوجه عام ، أدت زيادة مستويات التسميد الفوسفاتي إلى زيادة معنوية في محصول البذرة ومكوناته. وازداد محصول البذرة معنويا بمقدار ١٩,٧٩% و٢٦,١٢% في الموسم الأول وبمقدار ٢٠,٢٠% و ٢٦,٢٨% في الموسم الثاني بإضافة التسميد الفوسفاتي بمعدل ٣١,٠ و ٤٦,٥ كجم فو٢ا٥/فدان على التوالي بالمقارنة بإضافة ١٥,٥كجم فو٢ا٥/فدان.

كان للتسميد الحيوي بالفوسفورين تأثيرا معنويا على جميع الصفات تحت الدراسة. وازداد محصول البذرة والقش معنويا بمقدار ٥,٨٤% و٥,٧٢% في الموسم الأول وبمقدار٦,٣٩% و ٦,٩٣% في الموسم الثاني على التوالي بالمقارنة بعدم إضافة الفوسفورين.

أدى التفاعل بين ٤٦,٥ كجم فو٢ا٥/فدان والفوسفورين الى زيادة محصول البذرة بمقدار ٣١,٩٢% و٣٢,٧٧% في الموسم الأول والثاني على التوالي بالمقارنة بإضافة ١٥,٥كجم فو٢ا٥/فدان بدون فوسفورين.

ارتبط محصول البذرة (كجم / فدان)ارتباطا موجبا ومعنويا مع كل من عدد السيقان/نبات وعدد النورات/١٠نباتات ووزن بذور/١٠نباتات (جم) ووزن ١٠٠٠ بذرة (جم) والوزن النوعي للبذرة ومحصول القش (طن/فدان) خلال الموسمين.

أوضحت نتائج معامل المرور خلال الموسمين أن وزن بذور/١٠نباتات وتفاعلاته مع وزن ١٠٠٠ بذرة وعدد نورات/١٠نباتات هم أكثر الصفات ارتباطا بمحصول البذرة حيث ساهمت هذه الصفات بمقدار ٣٧,٤٩ و٢٥,٣٧ و١١,٦٩% فى الموسم الأول وبمقدار ٢٥,٢٥ و٢١,٩٦ و ١٦,٥٢% فى الموسم الثاني من التباين الكلى فى محصول البذرة على الترتيب.

توصى الدراسة بالتبكير فى الزراعة واستخدام التسميد الحيوي بالفوسفورين مع إضافة ٤٦,٥ كجم فو٢ا٥/فدان وذلك بالا راضى الرملية بمنطقة الإسماعيلية للحصول على اكبر محصول بذرة من البرسيم المصرى.