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EFFECT OF PLANT DENSITY ON SOME SOYBEAN CULTIVARS UNDER TWO PLANTING DATES

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Abstract

A field experiment was conducted at Zarzoora Agricultural Research Station, EL-Beheira governorate during 1999 and 2000 seasons to study the effect of five plant densities (70000, 105000, 140000, 175000 and 210000 plants/ fed) on three soybean cultivars (G.35 , L. G.111 and Crawford) under two sowing dates (May 1st and May 25th). The experimental design was spilt-spilt plot with three replications .The main results of this work could be summarized as follows :

1. Early planting on May 1st significantly increased plant height, weight of pods and seeds/plant, weight of 100 seeds, seed, oil and protein yields/ fed, but decreased seed crude protein percentage in both seasons. Differences in pods and seeds/plant as well as oil percentage were significant in one season. However, number of branches/ plant was not significantly affected by sowing date in both seasons.
2. Plant height, weight of seeds/plant, weight of 100 seeds, seed oil content and seed, oil and protein yields/fed in both seasons, number of pods and seeds/ plant and weight of pods/ plant in the first season only were significantly influenced by soybean cultivars, whereas number of branches/ plant and seed protein content were not significantly affected in both seasons.
3. Plant height and protein content were significantly increased by increasing plant population density up to 210000 plants/ fed. While seed yield/ fed as well as oil and protein yields were significantly increased with increasing density from 70000 up to 175000 plants/ fed in both seasons. All yield components an showed the opposite trend.
4. Planting date X soybean cultivar interaction significantly affected number of pods and seeds/ plant in the first season, weight of 100 seeds and seed oil % in both seasons. Interaction effects of planting date X plant density was significant on plant height, number of pods and seeds/ plant in one season, weight of 100 seed and seed oil % in both seasons. Plant height, number of branches/ plant and 100 seeds weight were significantly affected by the interaction between cultivar X plant density in the second season. None of the interactions had a significant effect on seed yield/fed in both seasons.

INTRODUCTION

The importance of soybean crop in Egypt as a source of edible oil and cake for poultry feed is increasing. Raising soybean production per unit area through different agricultural practices as planting date, plant density, variety and fertilization....etc. is necessary. Many researchers stated that planting date is an important factor for soybean productivity. Eid *et al.* (1980), Ali (1993) and Shafshak *et al.* (1997) indicated that delaying sowing date significantly decreased both plant height and seed yield/ fed as well as weight of 100 seeds.In addition, Pfeiffer and Pilcher (1987) stated that late planted soybean on July 3 produced lower yield than did earlier planting on 21 May. Moreover Pfeiffer and Pilcher (1987), El-Banna *et al.* (1991), Abdalla *et al.*(1993) and El-Attar and Sharaf (1993) reported that delaying sowing date from 22 April to 6 May or to 20 May decreased yield and yield components of soybean. Adam (1983) and Beaty *et al.* (1983) found that soybean in optimum date increased oil and protein percentage. The differences between soybean cultivars were recorded in plant height (Mahmoud 1994), number of branches, pods and seeds/ plant (El-Attar and Sharaf, 1993; Ali, 1993 and Zahou *et al.*, 1994), weight of pods and seeds/ plant and weight of 100 seeds (Samia *et al.*,1993; Shams El-Din *et al.*, 1997 and Shafshak *et al.*1997), and seed yield/ fed (Salama and Ghonema, 1990 and Shams El-Din *et al.*,1997). Different soybean cultivars recorded variations in seed oil and protein content (Salama and Ghonema,1990 and Shams EL-Din *et al.*, 1997). Many investigators reported that increasing soybean plant density increased plant height and seed yield/ fed (Ablett *et al.*, 1984; Zahou *et al*, 1994 and Shams El-Din *et al.*1997), decreased number of branches/ plant (Board *et al.*,1992), number of pods and seeds/ plant (El-Attar and Sharaf,1993),weight of pods and seeds/ plant (Board *et al.*,1992), 100 seeds weight Shafshak *et al.*(1997) and Shams El-Din *et al* (1997) recorded an increase in seed yield/fed by increasing plant density. Adam (1983) and Ali (1993) found a reduction in seed oil content and an increase in seed protein content by increasing plant density.

This study aimed at investigating the effect of plant density on some soybean cultivars under two planting dates.

MATERIALS AND METHODS

A field experiment was carried out at Zarzoora Experiment Station, El- Beheira governorate during 1999 and 2000 seasons to study the effect of five plant densities (70000,105000,140000,175000 and 210000 plants/fed on three soybean cultivars (G.35, G.111 and Crawford) under two planting dates(May 1st and May 25th).

Treatments were assigned in split-split plot design with three replications. Planting dates were arranged at random in the main plots, soybean cultivars were devoted to the sub-plots and plant densities were arranged at random in the sub-sub plots of 3x3.5 m (5 ridges 60 cm apart).

Soil texture of the experimental farm was clay with pH of 7.9 and 2.5 % organic matter content. Sowing took place on May 1st and May 25th in 1999 season and on May 3 rd and May 29 th in 2000 season. Soybean seedlings were thinned to 10,15,20,25 and 30 plants per meter of linear ridge to give 70000, 105000, 140000, 175000 and 210000 plants/ fed respectively. The other recommended agronomic practices for growing soybean were applied. At harvest a random sample of 10 plants was taken from each sub-sub plot to determine plant height, number of branches, pods and seeds/ plant, weight of pods and seeds/ plant and 100-seed weight. Seed yield/ fed was estimated from the three central ridges of each sub-sub plot.

Oil content was determined by using Soxhelt apparatus and seed crude protein content was determined using the modified micro-Kjeldahl's method of the A.O.A.C. (1970). Protein content was calculated through multiplying the total nitrogen x 6.25. Seed oil and protein yields/ fed were calculated by multiplying seed oil and protein percentages by seed yield/ fed.

Data were recorded and statistically analyzed according to procedures outlined by Snedecor and Cochran (1982). Treatment means were compared using the least significant difference (L.S.D.) at 5% level of probability.

RESULTS AND DISCUSSION

I. Sowing date effects:

Data presented in Table (1) indicated that plant height was significantly decreased with delaying sowing date from May 1st to May 25th in 1999 and 2000 seasons. Also, data in Table (1) revealed a tendency towards the decrease in number of branches/ plant with delayed sowing in both seasons. These results may be due to longer growing season and favorable environmental conditions for the early sown plants. This result is in agreement with those obtained by El-Banna *et al.* (1991) and Ali (1993).

Data in Table (1) revealed that number of pods and seeds/ plant in the first season only, weight of pods and seeds/ plant as well as weight of 100 seeds were significantly affected by sowing date. Sowing soybean on the first date recorded higher values of these characters compared to the second sowing date. The increases in weight of pods and seeds/ plant in the first sowing date were due to the favourable effect of longer growing period on plant height, pods and seeds/ plant. These results coincided with those obtained by El-Banna *et al.* (1991), Adam (1983) and Ali (1993).

Data in Table (2) revealed that sowing on May 1st significantly increased soybean seed yield/ fed compared to sowing on May 25th in both seasons. Seed yield increases of the first sowing date over those of delayed sowing were 29.18 and 35.60 % in the first and second seasons, respectively. These increments in seed yield/ fed can be attributed to the increase in plant height, pods, seeds/ plant, weight of pods, seeds/ plant and weight of 100 seeds. These results are in accordance with those obtained by Ali (1993), El-Attar and Sharaf (1993) and Shafshak *et al.* (1997), who reported that high temperature and short day length prevailing during July and August could be the main reason for the lower seed yield of delay sowing as they reduce plant height, branches, pod development and in turn seed yield.

Data presented in Table (2) indicated that the delay in sowing date significantly decreased oil % in the second season and oil and protein yields/ fed in both seasons Whereas, crude protein % behaved differ in both seasons. Reason in the reduction of oil and protein yields/fed because of delaying sowing date seemed to be related to the

decreased seed yield/ fed. These results agree with those obtained by Adam (1983), Beaty *et al.*(1983), Ali (1993) and Shafshak *et al.* (1997).

II. Soybean cultivars effect:

Soybean cultivars differed significantly from each other in plant height in both seasons as shown in Table (1). Tallest plants were recorded by G.111 followed by Crawford while the shortest plants were produced by G. 35 in both seasons. These differences among cultivars in plant height could be due to differences exist in their genetical background structures. Similar results were recorded by Zahou *et al.*(1994) and Shafshak *et al.*(1997).

Number of branches/ plant was not affected by cultivar in both seasons as shown in Table (1). Soybean cultivars significantly differed in number of pods and seeds/ plant and weight of pods/ plant in the first season. Weight of seeds/ plant and 100 seeds weight were significantly affected in both seasons. G.111 variety gave the highest values followed by Crawford, whereas G.35 gave the lowest values. This is completely true for each of number of pods and seeds/ plant, weight of pods and seeds/ plant and weight of 100 seeds. The superiority of G.111 may be due to the differences in genetical make up of the tested genotypes. Many investigators indicated differences among soybean cultivars in plant height (Salama and Ghonema, 1990), in number of branches, pods and seeds/ plant (Zahou *et al.*, 1994 and Shafshak *et al.*, 1997), in weight of pods and seeds/ plant and 100 seeds weight (Mahmoud 1994 and Shams El-Din *et al.*,1997).

Seed yield/ fed was significantly influenced by soybean cultivars in both seasons as shown in Table (2). Data revealed that G.111 was the highest yielder followed by Crawford and G.35 in both seasons. Seed yield/ fed of G.111 increased by 10.09 and 5.13 % in the first season and by 17.56 and 10.20 % in the second season over those of Crawford and G.35. Varietal differences in seed yield were indicated by Salama and Ghonema (1990), Zahou *et al* .(1994) and Shams El-Din *et al.*(1997).

There were significant differences among cultivars in seed oil %, oil and protein yields/ fed in both seasons, whereas seed protein percent was not significantly affected in both seasons. Similar results were obtained by Mohammed *et al.* (1993) and

Shams El-Din *et al.*(1997).

III. Plant density effects:

Results in Table (1) revealed evidence that plant height was significantly increased by increasing plant density from 70000 up to 175000 plants/ fed in the first season and up to 21000 plants/ fed in the second season. Such effect may be due to inter competition between soybean plants for light through the elongation of internodes. This result is coinciding with those obtained by Ali (1993), Zahou *et al.* (1994) and Shams El-Din *et al.*(1997).

Plant population density effects on all yield components were significant in 1999 and 2000 seasons as shown in Table (1). There was consistent and remarkable reduction in all seed yield attributes, i.e. number of pods and seeds/ plant, weight of pods and seeds/ plant and 100 seed weight with increasing plant density from 70000 up to 210000 plants/ fed. These results may be due to competition among plants for light intercepted by foliage, nutrients and water absorbed by the root system. These results are in agreement with those obtained by El- Attar and Sharaf(1993) Abdalla *et al.* (1993) on number of branches and pods/ plant Zahou *et al.*(1994) on weight of pods and seeds/ plant ; Adam(1983) and Board *et al.* (1992), Abdalla *et al*(1993) on weight of 100 seeds.

Concerning seed yield/ fed, data in Table (2) showed that seed yield/ fed was significantly increased with increasing plant density from 70000 up to 175000 plants/ fed in both seasons. The increases in plant density from 70000 up to 105000,140000,175000 and 210000 plants/ fed increased seed yield/ fed by 41.68, 85.72, 101.21 and 69.95 %, respectively in the first season and by 23.03, 64.43, 79.59 and 51.52 %, respectively in the second season over that of 70000 plants/fed. The superiority of 175000 plants/ fed in seed yield/ fed may be due to the great light interception during the vegetative and reproductive periods as reported by (Board *et al.*, 1992). These results are in agreement with those obtained by Zahou *et al.*, (1994) and Shafshak *et al.*(1997) who reported that increasing number of plants up to 175000 plants/ fed recorded the highest soybean seed yield/ fed.

Data in Table (2) indicated that seed oil and protein contents were significantly affected by plant population density in both seasons. Seed oil content took the negative trend of plant density, whereas seed protein content behaved positively in both seasons. Similar results were obtained by Ali (1993) and Shams El-Din *et al.* (1997). Oil and protein yields/ fed behaved positively with seed yield/ fed in both seasons (Table 2). These results coincided with those obtained by Ali (1993) and Shafshak *et al.* (1997).

VI. Interaction effects:

Table (3) revealed that number of pods and seeds/ plant in the first season and weight of 100 seeds and seed oil content in both seasons were significantly influenced by the interaction between sowing date X soybean cultivar. The highest values of these mentioned characters were obtained from G.111 cultivar sown on May 1st. In contrast, sowing G. 35 cultivar on May 25 gave the lowest values of pods and seeds/ plant in the first season, 100 seed weight in the second season and seed oil content in both seasons.

Plant height in the first season, number of pods and seeds/ plant in the second season, weight of 100 seeds and seed oil content in both seasons were significantly influenced by the interaction between planting date X plant population density as show in Table (4). Plant density of 210000 plants/ fed gave the tallest plants in the first sowing date. On the other hand, the shortest plants were obtained from the population of 70000 plants/ fed under the second sowing date. Moreover, number of pods and seeds/ plant and weight of 100-seeds as well as seed oil content were significantly affected by the interaction between sowing date X plant population density. The maximum values of these characters were obtained from 70000 plants/ fed in the first sowing date and the minimum values were recorded with 210000 plants/ fed when soybean planted on May 25th .

Results in Table (5) revealed that plant height, number of branches/ plant and weight of 100 seeds were significantly affected in the second season. The tallest plants were recorded with G.111 under 210000 plants/ fed, whereas the shortest plants were obtained from G.35 under 70000 plants/ fed. Number of branches/ plant and weight of 100 seeds gave the highest values with G.111 X 70000 plants/ fed,

whereas the lowest values for these characters were recorded with G.35 at 210000 plants/ fed. Seed yield per feddans was not significantly affected by any of the interactions.

It could be concluded that the highest seed yield can be obtained from planting on May 1st at a population density of 175.000 plants/ fed and G.111 genotype can be recommended for Behiera Governorate.

Table 1. Effect of sowing date, cultivar and plant density on some growth characters and yield components of soybean in 1999 and 2000 seasons.

Treatment	Plant height (cm)		No of branches/ plant		No of pods/ plant		No of seeds/ plant		Weight of pods/ plant (g)		Weight of seeds/ plant (g)		Weight of 100-seed (g)	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Sowing date														
May 1 st	92.53	98.55	2.58	2.44	51.44	45.93	151.48	140.08	44.2	42.48	25.3	24.66	16.65	16.97
May 25 th	84.6	84.86	2.45	2.34	47.53	42.84	139.66	135.55	37.8	36.62	22.85	22.09	16.26	16.52
L.S.D at 5% level	5.93	12.47	N.S.	N.S	2.47	N.S	5.71	N.S	5.55	5.51	2.49	2.4	0.26	0.38
Soybean cultivars														
G. 35	86.33	82.66	2.44	2.33	46.8	44.43	137.83	137	38.8	38.37	22.67	22.85	16.36	16.52
G. 111	91.06	98.23	2.58	2.45	52.06	44.06	153.23	139.33	43.53	40.6	25.061	24.1	16.63	17.01
Crawford	88.3	94.23	2.53	2.36	49.6	44.66	146.66	137.13	40.66	39.33	23.095	23.19	16.37	16.71
L.S.D. at 5 % level	4.04	3.21	N.S	N.S	2.35	N.S	0.67	N.S	2.52	N.S	1.21	0.69	0.24	0.11
Plant density														
70000 plants/ fed.	79.88	79.61	3.08	2.97	60	46.61	176.38	146	51.11	43.94	30.03	25.63	17.01	17.52
105000 plants/ fed.	83.83	85.88	2.82	2.76	55.27	47	162.61	143.38	46.61	41.77	27.36	24.65	16.8	17.18
140000 plants/ fed.	88.11	91.94	2.57	2.36	49.16	45.94	146.83	140.83	41.22	40.72	24.07	23.95	16.48	16.75
175000 plants/ fed.	93.05	98.44	2.17	2.11	43.77	42.83	129	134.27	35.33	38.16	20.86	22.71	16.19	16.33
210000 plants/fed.	86.93	102.66	1.97	1.7	39.22	37.55	114.05	124.61	30.72	33.16	18.04	19.94	15.78	15.93
L.S.D. at 5 % level	2.32	2.15	0.1	0.1	1.5	1.65	4.08	3.29	1.47	1.62	0.71	0.47	0.1	0.09

Table 2. Effect of sowing date, cultivar and plant density on soybean seed ,oil and protein yields/fed and seed oil and protein content in 1999 and 2000 seasons .

Treatment	Seed yield/fed. (kg)		Oil %		Oil yield/ fed (kg)		Protein %		Protein yield/fed (kg)	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Sowing date										
May 1 th	1443.44	1324.42	20.43	21. 01	294. 89	265. 01	36. 60	37. 01	534. 21	490. 16
May 25 th	1117.33	976.66	20.18	19.76	255. 47	192. 98	37. 60	38. 66	420. 11	377. 57
L.S.D at 5% level	93.61	210.69	N .S. .	1. 08	23. 70	59. 63	1.19	1. 09	52. 18	40. 31
Soybean cultivar.										
G. 35	1220.16	1064.5	19.44	20.38	241.25	215.53	36.75	37.65	443.47	395.93
G. 111	1343.33	1251.5	20.84	20.77	273.53	257.9	37.11	38.1	500.4	478.73
Crawford	1277.66	1135.36	20.63	20.02	258.59	225.99	37	37.67	494.54	435.4
L.S.D. at 5 % level	53.18	82.59	0.76	0.63	10.62	16.16	N.S	N.S	23.33	41.77
Plant density										
70000 plants/ fed.	801.66	800.55	21.15	21.59	166.78	173.13	36.22	36.64	290.36	293.32
105000 plants/ fed.	1135.83	984.94	20.77	20.92	236.01	206.33	36.56	37.27	415.25	367.08
140000 plants/ fed.	1488.88	1316.38	20.26	20.35	298.66	267.88	36.95	37.87	550.14	498.51
175000 plants/ fed.	1613.05	1437.77	19.86	19.47	320.35	285.54	37.31	38.46	601.82	552.96
210000 plants/fed.	1362.5	1213.05	19.49	19.35	265.55	234.72	37.72	38.78	513.93	470.42
L.S.D. at 5 % level	39.83	45.6	0.24	0.29	10.96	10.36	0.1	0.26	4.03	14.54

Table 3. Some soybean characters as affect by the interaction between planting date X cultivar in 1999 and 2000 seasons.

Treatment		No of pods/ plant	No of Seeds/ plant	Weight of 100 seeds (g)	Weight of 101 seeds (g)	Oil %	Oil %
Planting date	Soybean cultivar cultivars	1999	1999	1999	2000	1999	2000
May 1 st	G. .35	49.86	146.33	16.51	16.71	19.94	21.25
	G. 111	53.33	157.46	16.78	17.22	20.82	21.31
	Crawford	51.13	150.66	16.66	16.98	20.54	20.49
Mean		51.44	151.48	16.65	16.97	20.43	21.01
May 25 th	G. 35	43.73	129.33	16.22	16.32	19.98	19.51
	G. 111	50.80	149.00	16.48	16.80	20.42	20.23
	Crawford	48.06	140.66	16.08	16.45	20.14	19.55
Mean		47.53	139.66	16.26	16.52	20.18	19.55
L.S.D at 5 % level		3.30	9.55	0.09	0.15	1.07	0.90

Table 4. Some soybean characters as affected by the interaction between plant density x sowing date in 1999 and 20

Treatment		Plant height (cm)	No of pods/ plant	No of seeds/ plant	Weight of 100 seeds (g)	Weight of 101 seeds (g)	Oil %	Oil %
Planting date	Plant density	1999	2000	2000	2000	1999	1999	2000
May 1 st	70000 plant/fed	83.33	49.00	147.33	17.14	26.27	21.38	21.82
	105000 plant/fed	85.00	47.66	144.55	16.97	25.30	21.02	21.28
	140000 plant/fed	89.22	47.17	142.77	16.74	24.38	20.38	20.81
	175000 plant/fed	94.89	45.44	136.77	16.46	23.54	19.88	21.00
	210000 plant/fed	100.22	40.44	129.00	15.94	20.82	19.88	19.92
Mean		90.53	45.94	140.08	16.65	24.06	19.50	20.76
May 25 th	70000 plant/fed	78.44	48.22	144.66	16.88	25.00	20.91	21.36
	105000 plant/fed	82.66	46.33	142.22	16.63	24.01	21.53	21.55
	140000 plant/fed	87.00	44.77	138.88	16.23	23.52	20.13	19.88
	175000 plant/fed	91.22	40.22	131.77	15.92	21.88	19.84	19.48
	210000 plant/fed	95.66	34.66	120.22	15.62	19.06	19.48	18.78
Mean		86.59	42.84	135.55	16.25	22.69	20.17	20.01
L.S.D at 5 % level		3.29	2.34	4.66	0.14	0.13	0.34	0.41

Table (5): Some soybean characters as affected by the interaction between genotype x plant density in 1999 and 2000 seasons.

Characters	Treatment	Plant height (cm)	No. of branches / plant	Weight of 100-seeds (g)
Soybean cultivar	Plant density	2000	2000	2000
G. 35	70000 plant/fed	72.66	2.88	17.21
	105000 plants/fed	79	2.71	16.88
	140000 plants/fed	82.33	2.3	16.51
	175000 plants/fed	87.33	2.11	16.18
	210000 plants/fed	92	1.66	15.8
Mean		82.66	2.33	16.51
G. 111	70000 plants/fed	85.83	3.15	17.85
	105000 plants/fed	91.16	2.9	17.5
	140000 plants/fed	98.66	2.64	17.05
	175000 plants/fed	105.5	2.08	16.55
	210000 plants/fed	110	1.66	16.11
Mean		98.23	2.45	17.01
Crawford	70000 plants/fed	80.33	2.9	17.51
	105000 plants/fed	87.5	2.68	17.18
	140000 plants/fed	94.83	2.35	16.7
	175000 plants/fed	102.5	2.13	16.28
	210000 plants/fed	106	1.76	15.9
Mean		94.23	2.36	16.71
L.S.D. at 5 % level		3.1	0.15	0.13

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تاثير الكثافة النباتية على بعض أصناف فول الصويا تحت ميعادين للزراعة

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٢ قسم بحوث المحاصيل البقولية-معهد بحوث المحاصيل الحقلية-مركز البحوث الزراعية-الجيزة- مصر.

أقيمت تجربة حقلية فى محطة بحوث زرزورة بمحافظة البحيرة خلال موسمى الزراعة ١٩٩٩و٢٠٠٠ م وذلك لدراسة تأثير خمس كثافات نباتية (٧٠ و١٠٥و ١٤٠و ١٧٥و ٢١٠ الف نبات/ فدان) على ثلاثة أصناف فول صويا(جيزة ٣٥و جيزة ١١١وكراوفورد) تحت ميعادين للزراعة(١ مايو و ٢٥ مايو) وكان التصميم المستخدم هو القطع المنشقة مرتين فى ثلاثة مكررات وكانت أهم النتائج المتحصل عليها هى:

١- أدت زراعة فول الصويا فى اول مايو الى زيادة معنوية فى ارتفاع النبات ووزن قرون وبذور النبات ووزن ١٠٠ بذرة ومحصول الفدان من البذور والزيت والبروتين وكذا محتوى البذور من الزيت خلال موسمى الزراعة ، كما زادت معنويا عدد قرون وبذور النبات فى موسم واحد بينما نقصت معنويا نسبة البروتين و لم يتأثر عدد فروع النبات بميعاد الزراعة خلال موسمى الزراعة.

٢- كان لأختلاف اصناف فول الصويا تاثير معنوى على أرتفاع النبات ووزن بذور النبات ووزن ١٠٠ بذرة ومحصول كل من البذور والزيت والبروتين والنسبة المئوية للزيت خلال موسمى الزراعة بينما تأثر كل من عدد وبذور النبات ووزن قرون النبات فى الموسم الأول فقط ولم يكن هناك تأثير معنوى على صفتى عدد أفرع النبات ومحتوى البذور من البروتين خلال موسمى الزراعة.

٣- زاد ارتفاع النبات ومحتوى البذور من البروتين زيادة معنوية بزيادة الكثافة النباتية من ٧٠٠٠٠ الى ٢١٠٠٠٠ نبات/ فدان بينما سلكت مكونات المحصول عكس ذلك وحققت الكثافة النباتية ١٧٥٠٠٠نبات/ فدان أعلى انتاجية فدانية من البذور والزيت والبروتين فى موسمى الزراعة.

٤- أثر التفاعل بين ميعاد الزراعة واصناف فول الصويا معنويا على صفات عدد قرون و بذور النبات فى الموسم الأول ووزن١٠٠ بذرة والنسنة المئوية للزيت فى بذور فول الصويا فيالموسمين .كما تأثر طول النبات وعدد قرون وبذور النبات فى موسم واحد ووزن ١٠٠ بذرة والنسنة المئوية للزيت فى كلا الموسمين بالتفاعل بين ميعاد الزراعة والكثافة النباتية. وتأثر كل من ارتفاع النبات وعدد فروع النبات ووزن ١٠٠بذرة فى الوسم الثانى بالتفاعل بين أصناف فول الصويا والكثافة النباتية. هذا ولم يتأثر محصول الفدان من البذور بأى من التفاعلات المذكورة فى كلا الموسمين.

وعلى ضوء تلك النتائج فإنه للحصول على أفضل إنتاج من فول الصويا ينصح بالزراعة فى أوائل مايو بكثافة نباتية مقدارها ١٧٥٠٠٠ نبات بالفدان ، كما يوصى بزراعة الصنف جيزة ١١١ بمحافظة البحيرة.