RESPONSE OF SOME SHORT DURATION CULTIVARS OF SOYBEAN AND SUNFLOWER TO INTENSIVE CROPPING

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Abstract

A series of field experiments were carried out at the Experimental Station, Faculty of Agriculture, Mansoura University during 1995 and 1996 summer seasons to study the effect of six sowing dates, three soybean and sunflower cultivars and two sequence cropping of soybean and sunflower as well as their interactions on yield and yield components of both soybean and sunflower. The main findings indicated that.

1 - Early planting on mid May produced highest pods number /plant of soybean, highest head diameter of sunflower, heaviest 100-seed weight, seed yield /plant, seed and oil yields /ha as well as total income /ha of both soybean and sunflower.
2 - Soybean CV. Giza 82 and sunflower CV. Pheobus produced the heaviest 100-seed weight, highest seed yield /plant, seed and oil yields /fad as well as highest soybean pods number /plant and highest sunflower head diameter compared with the other cultivars.
3 - In early or lately planting, the sequential cropping of soybean CV HA70 followed by sunflower CV. Pheobus or planting sunflower CV. Pheobus followed by soybean CV. HA70 significantly increased 100-seed weight, seed yield /plant, seed and oil yields /ha as well as the total income per season.
4 - The interaction between sowing date and sunflower cultivars had significant effects on sunflower head diameter, 100-seed weight, seed yield /plant, seed and oil yields /fad. In early planting, planting pheobus cultivar on mid-May as well as in lately planting, planting pheobus cultivar on mid-July produced the highest values of the above characters.
In general, planting soybean CV HA70 early on mid May followed by sowing sunflower CV. Pheobus on mid August or the revise sequence resulted in maximizing land productivity of seed and oil yields per season of the two cultivars under the environmental conditions of Dakahlia district.

Introduction

Soybean (*Glycine max*, (L.) Merr.) and sunflower (*Helianthus annus*, L.) are considered two of the major oil crops in the world. In Egypt, they are newly introduced oil crops to reduce the oil shortage. This could be achieved by intensifying their production under multiple cropping systems, such as sequential cropping .

Early planting on mid April and first May (El-Attar and Sharaf, 1993 , Mohamed, 1994 and Mohamed, 1996) or on mid May (Sarmah *et al*., 1994) significantly increased number of pods /plant, seed weight /plant, 100-seed weight and seed yield /ha. In addition, sunflower planting on May 26th (Sharief and Said, 1993), or on mid May (Salama, 1996), or on January (Sidhu *et al*., 1995) or on 20th March (Rivelli and Perniola, 1997) markedly increased head diameter, 100-seed weight, seed and oil yields per unit area.

Many previous studies indicated significant differences in the performance of soybean cultivars showed significant differences. Cultivars L21 (Mohamed, 1994), Keller and Corsoy 79 (Abd El-Gawad and El-Batal, 1995) and Crawford (Mohamed, 1996) produced the highest number of pods /plant, 100-seed weight, seed yield /plant and per unit area amongst the studied soybean cultivars. In turn, sunflower cultivars also varied in their growth and development. Giza 1 (Abd El-Samie *et al*., 1995, Sarhan, 1995 and Salama, 1996), Majak (Abou Kresha *et al*., 1996), Lines 1383 and 1374 (Guirguis *et al*., 1996) and Hysun (El-Karamity and El-Serogy, 1997) were the highest in 100-seed yield, seed yield /plant, seed and oil yields per unit area compared with other tested cultivars.

Intensive cropping of soybean and sunflower in the summer season after winter crops is very important technique to maximize unit land production to bridge the gap of edible oil between production and demand. This can be achieved by using short season soybean and sunflower cultivars. Copeland *et al*., (1993) found that crop grown in sequence might deplete water more than the same crop grown under monoculture. Tony (1996) stated that nitrogen fertilization of sunflower had a significant effect on the grain yield of the succeeding wheat .

Regarding the interaction between sowing date and soybean cultivars, it was noted that the determinate cultivars yielded less when planted on May

(Elmore, 1990). Crawford and Cultar 71 cvs were superior to other cultivars in productivity with April and early May planting (El-Attar and Sharaf, 1993). Mohamed (1994) reported that planting on mid May of CV. L21 produced higher seed and oil yield /fad than any other genotypes planted on June 15th. The early growing of CV. Rib 77 (Ortegon and Diaz, 1997), and the earlier sowing date of Rom Sun cultivar (Rivelli and Perniola, (1997) had a significant positive effect on yield.

The present study was initiated primarily to determine the effect of intensive cropping of two short season cultivars of soybean and sunflower , sowing dates and their sequential cropping on yield and yield components as well as oil yield under the environmental conditions of Dakahlia district.

Materials and methods :

A series of field experiments were carried out at the Experimental Station, Faculty of Agriculture, Mansoura University during 1995 and 1996 summer seasons.

The preceding crop was Egyptian clover *(Trifolium alexandranium, L.)* in the two seasons. Experimental soil was loamy clay and mechanical, chemical analyses of the soil (Table 1) were estimated according to Page *et al*. (1982).

Table 1
Mechanical and chemical analysis
of the experimental soil.

Season	Mechanical analysis				Chemical analysis			
	Sand %	Fine sand %	Silt %	Clay %	Organic matter %	Avilable N ppm	Ece cm mohes	pH
1995	1.79	27.99	31.70	38.52	1.7	30.3	3.45	7.7
1996	1.55	28.04	29.13	41.28	1.8	29.1	4.90	8.0

The soybean and sunflower cultivars used in this study were kindly provided by Legume Crops Dept. and Oil Crops Dept. Agric. Res. Center Ministry of Agric. The experiment comprised 54 treatments which were the combinations of sex sowing dates (Three early summer plantings i.e. mid April, first May, mid May and three late summer plantings i.e. mid July,

first August and mid August), three soybean cultivars (HA 68, HA 70, Giza 82) and three sunflower cultivars (Vidoc, Pheobus, G101). Each experiment was assigned to one sowing date and arranged in a randomized complete block design with four replicates. Each sowing date included three soybean or three sunflower cultivars. In each season combined analysis included the combination of three sowing dates, three cultivars of soybean and three of sunflower was performed. Sequence cropping soybean followed by sunflower or sunflower followed by soybean was taken into consideration.

Seeds of soybean were sown in hills with 10 cm between hills in one ridge side. Sunflower seeded in hills 20 cm apart in one ridge side. For soybean, plants were thinned to two plants per hill after three weeks from sowing to attain a plant density of 335000 plants/ha. Sunflower plants were thinned to one plants per hill giving plant density of 84000 plants/ha. Phosphorus was applied during soil preparation as calcium superphosphate (15.5 % P_2O_5) at a rate of 350 kg /ha. Nitrogen fertilizer was applied as urea (46 % N) at a rate of 150 kg N/ha in three doses 40, 70, 40 kg N/ha with the first, second and third irrigation to soybean cultivars and with 150 kg N/ha on two equal doses, half was added before the first irrigation and the second half before the second sunflower irrigation. Other recommended agricultural practices were followed. In lately sown crops on mid July, first August and mid-August, sunflower or soybean seeds were planted after full maturity of early sown crops without tillage and replacing soybean with sunflower or vice verse in two sequence cropping system.

After harvesting, the following growth and yield characters were measured. Sunflower head diameter, soybean number of pods/plant as well as 100-seed weight, seed yield /plant and seed yield in kg/ha for both crops. A sample of five grams of air dried seeds taken from each treatment was dried in an oven with a driven hot air at 70 c° until a constant weight was reached. Seed oil percentage was determine according to A.O.A.C., 1984 and oil yield/ha was estimated by multiplying seed yield /ha by seed oil content.

Data were exposed to the proper statistical analysis of variance as mentioned by Gomez and Gomez (1984). Combined analysis between sowing dates and seasons was done. Least significant difference (L.S.D) at 5 % level of significance was used to compare treatment means.

Results and discussion

Sowing in early summer or in lately summer significantly affected pods /plant of soybean, head diameter of sunflower, 100-seed weight, seed yield /plant, seed and oil yields /ha for both soybean and sunflower (Tables 2-7). Early sowing on mid May produced significantly the highest pods /plant, head diameter, 100-seed weight, seed yield /plant, seed and oil yields /ha of both soybean and sunflower as compared to mid April or first May sowing. In addition, the late sowing on mid July produced significantly higher pods/plant, head diameter, 100-seed weight, seed yield /plant, seed and oil yields /ha as compared with sowing on the first or mid August. Generally, sowing on mid August produced the lowest pods /plant, head diameter, 100-seed weight, seed yield /plant, seed and oil yields/ha of both crops as compared with other sowing dates. It could be concluded that early planting of both soybean and sunflower exceeded late planting on mid April, first May, mid July, first August and mid August planting in both seasons. These increases in seed yield of soybean and sunflower due to the increase caused by early sowing on pods/plant and head diameter, 100-seed weight and seed yield /plant of both soybean and sunflower. The increase in yield components might be due to an increase in the vegetative phase and more or less suitable environmental conditions especiallylower temperature which enhanced the photosynthetic efficiency that resulted in more seeds per plant and more dry matter in the seeds. Similar results were reported by El-Attar and Sharaf (1993), Mohamed (1994) and (1996) in soybean and Sharief and Said (1993), Sidhu *et al*., (1995), Salama (1996) and Rivelli and Perniola (1997) in sunflower.

Combined analysis of data presented in Tables 2 - 8 indicated that soybean CV. Giza 82 surpassed HA 68 and HA 70 in pods/plant, 100-seed weight, seed yield/plant, seed and oil yields/ha as well as total income in the early or late sowing. In addition, sowing sunflower CV. Pheobus produced highest head diameter, 100-seed weight, seed yield /plant, seed and oil yields/ha as well as total income in the early or late dates. However, the lowest pods number /plant, 100-seed weight, seed yield/plant, seed and oil yields/ha as well as total income were for planting soybean CV. HA 68 in the early or late dates. Meanwhile, lowest head diameter values, 100-seed weight, seed yield /plant, seed and oil yields /ha were obtained by sowing sunflower CV. G 101 in both early or late dates. The increases in seed

yield/ha of both soybean CV. Giza 82 and sunflower CV. Pheobus in both early or late planting as compared with other cultivars may be due to their high efficiency in producing yield components such as pods/plant (Table 3), 100-seed weight (Table 4) and seed yield /plant (Table 5). The differences in pods/plant or head diameter , 100-seed weight and seed yield /plant of soybean in early or late planting may be attributed to genetic factors and their interaction with the prevailing environmental conditions. The increase in oil yield /ha from planting soybean CV. Giza 82 and sunflower CV. Pheobus may be due to their high seed yield /ha (Table 6) rather than differences in seed oil content. Similar conclusions were reported by Mohamed (1994), Abd El-Gawad and El-Batal (1995) and Mohamed (1996) on soybean cultivars and Abd El-Samie *et al*. (1995), Sarhan (1995), Salama (1996), Abou Kresha *et al.*(1996) and El-Karamity and El-Serrogy (1997) on sunflower.

Analysis of combined data presented in Tables 2 - 8 indicated that planting soybean CV. HA 70 followed by sunflower CV. Pheobus or planting sunflower CV. Pheobus followed by soybean CV. HA 70 produced the highest increase in yield, yield components and total income. However, planting soybean CV. HA 68 followed by sunflower CV. Vidoc or the reverse sequence resulted in the lowest yield, yield components and the total income per season. In addition, the expected sequential cropping that could maximize seed yield per unit area and the total income/ha was attained by sowing CV. Giza followed by CV. Pheobus or vice versa.

A significant interaction was found between sunflower cultivars and sowing dates (Tables 2 - 7) in both early or late sowing. The interaction between sunflower cultivars and sowing dates significantly affected head diameter, 100-seed weight, seed yield /plant, seed and oil yields/ha. Maximum head diameter, weight of 100-seed, seed yield /plant, seed and oil yields/ha were produced as a result of the interaction of early sowing or late sowing on mid July with sunflower CV. Pheobus. However, the early sowing on mid April or late sowing on mid August of sunflower CV G101 produced the lowest values of head diameter, 100 -seed weight, seed yield/ plant, seed and oil yields/ha. Similar significant interactions between sunflower cultivars and sowing dates were reported by Sharief and Said

Table (2)

Number of soybean pods/plant as affected by sowing dates and sequential cropping (combined data over both seasons)

Sowing dates*		Soybean cvs.			LSD 5%	Mean
		HA 68	HA 70	Giza 82		
Early	Mid April	108.3	110.9	121.0	N.S	113.4
	First May	115.1	124.9	136.3	9.9	125.4
	Mid May	100.9	108.8	128.4	10.2	112.7
	LSD at 5%		N.S			3.1
	Mean	108.1	114.8	128.5	3.1	117.2
		Soybean preceded by sunflower			LSD 5%	Mean
		HA 68	HA 70	Giza 82		
Late	Mid July	92.4	103.5	118.4	9.5	104.8
	First Aug.	84.3	95.0	96.6	9.3	92.0
	Mid Aug.	41.9	50.8	63.8	10.1	52.1
	LSD at 5%		N.S			3.1
	Mean	72.8	83.1	92.9	3.1	82.9

*Sowing of mid April, first May and mid May of soybean and sunflower were followed by sowing of mid July, first August and mid August of sunflower and soybean in sequence, respectively.

Table (3)

Mean head diameter (cm) of sunflower cultivars as affected by sowing dates and sequential cropping (combined data over both seasons)

Sowing dates*		Sunflower cvs.			LSD 5%	Mean
		Vidoc	Pheobus	G 101		
Early	Mid April	13.5	14.3	12.3	0.7	13.3
	First May	14.0	14.6	12.2	1.0	13.6
	Mid May	13.9	14.4	12.5	1.1	13.6
	LSD at 5%		0.5			0.3
	Mean	13.8	14.4	12.3	0.3	13.5
		Sunflower preceded by soybean			LSD 5%	Mean
		Vidoc	Pheobus	G 101		
Late	Mid July	13.9	14.5	12.7	1.0	13.7
	First Aug.	13.1	13.5	12.0	0.6	12.9
	Mid Aug.	12.2	13.1	11.5	0.7	12.2
	LSD at 5%		0.5			0.3
	Mean	13.1	13.7	12.0	0.3	12.9

*Sowing of mid April, first May and mid May of soybean and sunflower were followed by sowing of mid July, first August and mid August of sunflower and soybean in sequence, respectively.

Table (4)
Means of 100-seed weight of some soybean and sunflower cultivars as affected by sowing dates and sequential cropping (combined data over 1995 and 1996 seasons)

Sowing dates*		Soybean cvs.			LSD 5%	Mean	Sunflower cvs.			LSD 5%	Mean
		HA 68	HA 70	Giza 82			Vidoc	Pheobus	G 101		
Early	Mid April	9.6	10.5	10.9	0.5	10.3	5.6	6.7	5.4	0.4	5.9
	First May	10.2	10.7	11.4	0.7	10.8	6.0	7.3	6.0	0.4	6.4
	Mid May	11.0	10.4	11.8	0.5	11.4	6.9	7.8	6.4	0.5	7.0
	LSD at 5%	N.S				0.2	0.2				0.1
	Mean	10.3	10.9	11.4	0.2	10.8	6.2	7.2	5.9	0.1	6.4
		Sunflower preceded by soybean					Soybean preceded by sunflower				
		Sunflower cvs.			LSD 5%	Mean	Soybean cvs.			LSD 5%	Mean
		Vidoc	Pheobus	G 101			HA 68	HA 70	Giza 82		
Late	Mid July	6.2	7.4	6.0	0.4	6.5	10.5	10.9	11.2	0.3	10.9
	First Aug.	5.6	6.3	5.2	0.3	5.7	8.6	9.4	9.7	0.5	9.2
	Mid Aug.	4.7	5.1	4.6	0.3	4.8	5.9	6.0	6.9	0.5	6.2
	LSD at 5%	0.2				0.1	N.S				0.2
	Mean	5.5	6.3	5.3	0.1	5.7	8.3	8.8	9.2	0.2	8.8

* owing of mid April, first May and mid May of soybean and sunflower were followed by sowing of mid July, first August and mid August of sunflower and soybean in sequence, respectively.

Table (5)

Means of seed yield /plant (g) of some soybean and sunflower cultivars as affected by sowing dates and sequential cropping (combined data over 1995 and 1996 seasons).

Sowing dates*		Soybean cvs.			LSD 5%	Mean	Sunflower cvs.			LSD 5%	Mean
		HA 68	HA 70	Giza 82			Vidoc	Pheobus	G 101		
Early	Mid April	8.4	9.2	10.0	0.5	9.2	37.5	40.5	32.8	2.0	36.9
	First May	8.9	9.8	10.4	0.5	9.7	37.6	41.3	36.1	2.4	38.3
	Mid May	9.3	10.0	10.7	0.7	10.0	40.1	42.5	35.1	3.2	39.2
	LSD at 5%		N.S			0.4		1.3			0.8
	Mean	8.9	9.7	10.3	0.4	9.6	38.4	41.4	34.6	0.8	38.1
		Sunflower preceded by soybean					Soybean preceded by sunflower				
		Sunflower cvs.			LSD 5%	Mean	Soybean cvs.			LSD 5%	Mean
		Vidoc	Pheobus	G 101			HA 68	HA 70	Giza 82		
Late	Mid July	38.8	41.1	34.3	3.0	38.1	8.6	9.5	9.9	0.7	9.3
	First Aug.	31.8	33.7	30.1	2.1	31.9	6.3	6.9	7.2	0.4	6.8
	Mid Aug.	26.0	29.1	24.3	1.8	26.5	4.9	5.1	5.9	1.6	5.3
	LSD at 5%		1.3			0.8		N.S			0.4
	Mean	32.2	34.7	29.6	0.8	32.2	6.6	7.2	7.7	0.4	7.2

* Sowing of mid April, first May and mid May of soybean and sunflower were followed by sowing of mid July, first August and mid August of sunflower and soybean in sequence, respectively.

Table (6)

Means of seed yield (ton/ha) of some soybean and sunflower cultivars as affected by sowing dates and sequential cropping (combined data over 1995 and 1996 seasons)

Sowing dates*		Soybean cvs.			LSD 5%	Mean	Sunflower cvs.			LSD 5%	Mean
		HA 68	HA 70	Giza 82			Vidoc	Pheobus	G 101		
Early	Mid April	2492.88	2804.96	2906.48	166.145	2734.695	2822.585	3065.81	2692.395	125.02	2860.42
	First May	2705.085	2910.005	3142.185	148.99	2918.935	2959.12	3029.62	2922.93	#VALUE!	2970.4
	Mid May	2679.47	2965.23	3236.42	109.98	2960.295	3030.325	3107.875	2772.53	136.535	2970.165
	LSD at 5%	N.S				136.2	N.S				46.290
	Mean	2625.89	2893.32	3094.95	136.2	2871.23	2937.5	3067.69	2795.795	46.290	2933.74
		Sunflower preceded by soybean					Soybean preceded by sunflower				
		Sunflower cvs.			LSD 5%	Mean	Soybean cvs.			LSD 5%	Mean
		Vidoc	Pheobus	G 101			HA 68	HA 70	Giza 82		
Late	Mid July	2887.915	2939.38	2456.69	158.155	2761.25	2510.505	2679.705	2838.565	163.56	2676.18
	First Aug.	2434.365	2790.155	2396.765	158.625	2540.35	1804.565	2061.185	2229.68	78.255	2031.81
	Mid Aug.	2015.36	2414.155	1876.945	117.03	2102.075	1511.52	1576.615	1791.405	66.505	1626.435
	LSD at 5%	N.S				46.23	N.S				37.83
	Mean	2445.88	2714.485	2243.545	46.23	2467.97	1942.04	2105.835	2286.315	37.83	2111.475

* Sowing of mid April, first May and mid May of soybean and sunflower were followed by sowing of mid July, first August and mid August of sunflower and soybean in sequence, respectively.

Table (7)

Means of oil yield (ton/ha) of some soybean and sunflower cultivars as affected by sowing dates and sequential cropping (combined data over 1995 and 1996 seasons)

Sowing dates*		Soybean cvs.			LSD 5%	Mean	Sunflower cvs.			LSD 5%	Mean
		HA 68	HA 70	Giza 82			Vidoc	Pheobus	G 101		
Early	Mid April	489.04	582.10	639.44	49.59	570.11	1063.61	1175.94	937.89	106.93	1059.15
	First May	571.52	625.34	726.62	51.23	641.08	1217.77	1284.28	1192.16	N.S	1231.40
	Mid May	569.41	663.64	768.69	50.06	667.17	1227.88	1316.94	1092.05	153.93	1212.37
	LSD at 5%	N.S				10.81	N.S				27.97
	Mean	543.32	623.69	711.58	10.81	626.04	1169.83	1259.13	1074.19	27.97	1167.72
		Sunflower preceded by soybean					Soybean preceded by sunflower				
		Sunflower cvs.			LSD 5%	Mean	Soybean cvs.			LSD 5%	Mean
		Vidoc	Pheobus	G 101			HA 68	HA 70	Giza 82		
Late	Mid July	977.60	1153.15	843.89	71.91	991.47	546.14	609.59	687.61	54.76	614.53
	First Aug.	739.55	948.70	685.50	67.68	791.25	336.29	396.68	457.08	22.33	396.68
	Mid Aug.	511.13	732.50	478.70	48.18	574.11	281.53	297.51	329.00	22.09	302.68
	LSD at 5%	N.S				27.97	N.S				10.81
	Mean	742.84	944.70	669.52	27.97	785.61	387.99	434.75	491.15	10.81	438.04

* Sowing of mid April, first May and mid May of soybean and sunflower were followed by sowing of mid July, first August and mid August of sunflower and soybean in sequence, respectively.

Table (8)

Total income /ha in L.E. as affected by sowing dates, cultivars and sequential cropping of soybean and sunflower cultivars (combined data over 1995 and 1996 seasons).

Sowing date	Sequential cropping							
	Soybean HA 68 followed by sunflower CV. Vidoc	Soybean HA 70 followed by sunflower CV. Pheobus	Soybean Giza 82 followed by sunflower CV. G 101	Mean	Sunflower CV. Vidoc followed by soybean HA 68	Sunflower CV. Pheobus followed by soybean HA 70	Sunflower CV. G 101 followed by soybean Giza 82	Mean
Sowing on mid April followed by sowing on mid July	5960	693.25	5853.9	6048.9	5898.5	6359	6070	6110
Sowing on first May followed by sowing on first August	5626	6258.1	6018.4	5966.65	5355.65	5696	5736	5595
Sowing on mid May followed by sowing on mid August	5097	5863.3	5489.6	5482.55	5148.85	5306	5118	5191
Mean	5560	6152.3	5788.1	5832.7	5468.45	5788	5642	5633

(1993), Ortegon and Diaz (1997), Rivelli and Perniola (1997) and Sharief (1998).

In general, it could be concluded that maximizing seed and oil yields per unit area/ season can be achieved by planting soybean Giza CV on mid-May followed by sunflower Pheobus CV on mid-July or vice versa. The highest total income was produced by planting soybean CV. HA 70 on first May followed by sunflower CV. Pheobus on the first of August. However in late sowing, planting sunflower CV. pheobus in mid-April followed by planting soybean HA 70 on mid-July proved to be a success.

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استجابة بعض أصناف قصيرة العمر من فول الصويا ودوار الشمس للتكثيف المحصولى

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الملخص :

أجريت سلسلة من التجارب الحقلية بمزرعة محطة البحوث الزراعية بكلية الزراعة ـ جامعة المنصورة خلال الموسمين الصيفيين ١٩٩٥ و ١٩٩٦ وصممت كل منها بنظام القطاعات الكاملة العشوائية فى أربع مكررات وقد شملت كل تجربة بالدراسة ثلاث أصناف من فول الصويا وكذلك ثلاث أصناف من دوار الشمس وذلك فى عروتين الأولى الصيفية المبكرة (منتصف ابريل ، أول مايو ومنتصف مايو) وعروة صيقية متأخرة (منتصف يوليو ، أول أغسطس ومنتصف أغسطس) وتم زراعة هذه الأصناف والمواعيد تعاقبيا الأولى أصناف فول الصويا ثم أصناف دوار الشمس والثانية أصناف دوار الشمس ثم أصناف فول الصويا وذلك فى ٦ تجارب حقلية فى كل موسم.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى.

١ـ أشارت النتائج إلى أن الزراعة المبكرة لكل من فول الصويا ودوار الشمس فى منتصف مايو سجلت أعلى قيم لعدد القرون لنبات فول الصويا وأكبر قطر لقرص دوار الشمس وأعلى القيم لصفات وزن المائة بذرة ، محصول البذور /نبات ، محصول البذور والزيت للفدان ، العائد النقدى الكلى لكل من فول الصويا ودوار الشمس.

٢ـ اختلفت أصناف فول الصويا ودوار الشمس معنويا داخل كل ميعاد زراعة وأثرت على كل من صفات المحصول ومكوناته. وقد تفوق فول الصويا صنف جيزة ٨٢ وسجل أعلى قيم لصفات عدد القرون للنبات ومحصول البذور /نبات ووزن الـ١٠٠ بذرة ومحصول البذور والزيت للفدان. بينما تفوق دوار الشمس صنف فيبوس وسجل أعلى

قيم لصفات قطر للنورة ووزن الـ١٠٠ بذرة ومحصول البذور للنبات ومحصول البذور والزيت للفدان وكذا العائد النقدى الكلى فى الموسم.

٣- أثر التعاقب المحصولى للأصناف على محصول النبات ومحصول البذور والزيت للفدان وكذلك قطر نورة دوار الشمس وعدد القرون فى فول الصويا، حيث أدت زراعة فول الصويا صنف هـ ع ٧٠ يتبعه دوار الشمس صنف فيبوس أو العكس إلى زيادة فى وزن المائة بذرة ومحصول البذور للنبات ومحصول البذور والزيت للفدان والعائد النقدى الكلى وكذلك عدد القرون/ نبات فى فول الصويا وقطر القرص فى دوار الشمس وذلك فى كل من الزراعة المبكرة والمتأخرة.

٤- لم يكن للتفاعل بين مواعيد الزراعة وأصناف فول الصويا أثرا معنويا على عدد القرون / نبات، وزن المائة بذرة ، محصول البذور /نبات ، ومحصول البذور والزيت للفدان. بينما أثر التفاعل بين مواعيد الزراعة وأصناف دوار الشمس معنويا على قطر القرص، وزن المائة بذرة، محصول البذور للنبات ومحصول البذور والزيت للفدان.

توصى الدراسة بزراعة فول الصويا صنف هـ.ع ٧٠ فى المنتصف من مايو تبوعا بزراعة دوار الشمس صنف فيبوس فى المنتصف من يوليو أو العكس يمكن أن يعظم العائد النقدى الكلى لوحدة المساحة وبالتالى يرفع الدخل القومى للمزارع فى إقليم محافظة الدقهلية.