SOLID VERSUS INTERCROPPING SESAME WITH GROUNDNUT AT DIFFERENT SEQUENCES OF SOWING DATES

I – SESAME YIELD AND YIELD COMPONENTS

BY

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ABSTRACT

Very little is known about the effects of relative sowing dates of sesame and groundnut under intercropping together. Therefore, the main objective of the present investigation was undertaken as an effort to provide additional data about the effect of optimum sowing date for sesame and groundnut when both intercropped together. So, two sesame cultivars (G.25 and G.32) and a groundnut cultivar (G.5) were sown solely or intercropped together on two sowing dates April 15th and May 15th; for both crops. The experiments were laid out in a split plot design with four replicates. The two sesame cultivars occupied the main plots, while, the six cropping treatments i.e., two sole sesame treatments and four intercropping systems (combination of two sowing dates for both crops) were arranged in the sub-plots.

The obtained results of sesame showed that G.32 surpassed G.25 cultivar in seed yield /fed., seed yield /plant; in both seasons; and number of capsules/plant, in the second season. On the other hand G.25 cultivar was significantly superior than G.32 in number of fruiting branches/plant in both seasons. At the same time, the two cultivars didn't significantly differ in the percentage of survived plants and seed index in both seasons.

The intercropping tended two reduce all studied traits. The early planting of sole sesame on April 15th significantly surpassed late planting on May 15th in yield and yield components except for the percentage of survived plants in both seasons and seed index in the first season.

There was significant interaction between sesame cultivars and sowing dates of sole sesame plantings in number of fruiting

branches/plant in both seasons. Also, the interaction between sesame cultivars and intercropping systems was significant with seed yield (kg/fed.), number of fruiting branches/plant in both seasons and number of capsules/plant in the first season.

INTRODUCTION

In underdeveloped countries, where land is limited, intercropping patterns may be a suitable way to increase the productivity of land. Mohamad *et al.*, (1986) showed that intercropping system resulted in an increase in the total combined yield. In this concern, many other researchers calculated the Land Equivalent Ratio (LER) and stated that intercropping produced the higher LER compared with solid planting (Galal et al. 1983; Badran 1988; Assey *et al*, 1992 ; Badran 1994 ; Abdel- Aal *et.al* 2000[a] and Abdel- Aal *et al.* 2000[b]). Both sesame and groundnut are considered as main summer crops in sandy soils in Egypt. Intercropping both two crops is considered a convenient practice which may lead to reduce labour peaks, minimize crop failure risk, reduce the adverse effects of pests, provide higher returns and , finally, to replenish oil crop production.

The merits of intercropping sesame with groundnut have been well referd to by Desal and Goyal (1980), Ahlawat *et al.* (1986), Sharma and Mevsingh (1987), El-Mihi *et al* (1990), El-Khawaga *et al.* (1992) Gabr *et al.* (1993) and Gabr (1998).

The proper sowing date for the two crops when both intercropped together are considered as an important factor, among the main factors, influencing the yield and yield components. Gabr *et al.* (1993) stated that seeding sesame and groundnut at the same time, had the best effect on growth and yield of sesame, whereas, delaying seeding of sesame two weeks after planting groundnut had the worst effect on growth and yield of sesame. They also found an increase of 12.90 and 7.04%; in yield of intercropped sesame with groundnut seeded at the same time and those seeded one week later after groundnut , respectively; over those seeded two weeks after groundnut. The present study was undertaken as an effort to provide

additional information about the effect of optimum sowing date for sesame when intercropped with groundnut.

MATERIALS AND METHODS

Two field Experiments were carried out during the two growing successive seasons of 2000 and 2001 at the Experimental Farm of El-Bostan, Faculty of Agriculture, Damanhour, Alexandria University. The main objective of the present study was to determine the optimum sowing date for intercropping both sesame and groundnut.

Sesame seeds were mixed with sand during sowing to better seed distribution. Both intercropped sesame and groundnut crops were seeded on the same ridge, spaced 60 cm apart. Sesame seeds were sown on the southern side of the ridge, while groundnut seeds occupied the other northern side.

The plant populations/fed. of sesame and groundnut were to 93333 and 70000 respectively. The two respective plant populations were maintained through thinning sesame seedlings to two plants/hill spaced 15 cm apart and groundnut in two plants / hill spaced 20 cm apart.

Four intercropping patterns of the combination of April 15th and May 15th sowing dates, for both crops were as follows:

1- Sesame and groundnut were simultaneously planted on the same day, in mid April (S_1G_1).

2- The two crops were simultaneously planted on the same day, but in mid May (S_2G_2).

3- Early planting of sesame, in mid April, was followed by planting of groundnut in mid May (S_1G_2).

4- Early planting of groundnut, in mid April, was followed by planting of sesame in mid May (S_2G_1).

Moreover, two solely sesame treatments at each of the two assigned planting dates , i.e., sole sesame in mid April (S_1) and sole sesame in mid May (S_2) used as controls.

The previous Six treatments were evaluated for two sesame cultivars Giza 25 and Giza 32. The groundnut cultivar was Giza5.

A split-plot design with four replications was performed. The main plots were randomly devoted to the sesame cultivars, while the eight intercropping treatments were randomly assigned to the sub-plots. Each sub-plot consisted of six ridges with four meter long.

Nitrogen fertilizer was side-dressed at the rate of 45 kg N/fed. as ammonium sulphate (20.6%N). One-third of the amount was added at the first irrigation and the rest was applied at the second irrigation in both sole-cropping and simultaneous intercropping, while for the sequential intercropping treatments, in which the two crops were planted at two different dates, the first application of nitrogen fertilizer was added at sowing irrigation of the latest planted crop, while the second dose was applied at the subsequent irrigation. Phosphorus fertilizer, at a rate of 31 Kg P_2O_5/fed. was mixed with the soil before sowing, while potassium fertilizer, at a rate 24 Kg K_2O/fed., was drilled among ridges before the second irrigation.

All other cultural practices, recommended for El-Bostan region, were applied for both crops. Ten guarded plants, were randomly taken from each sub plot to determine the yield components, i.e., % survived plants, no. of fruiting branches/plant., seed yield /plant (g) , weight of 1000 seeds (seed index) and no. of capsules/plant , while the yield was recorded from all sub plot guarded ridges and converted into kg/fed. The collected data were statistically analyzed according to the procedure described by Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

1- Seed Yield /Fed.

Data presented in Tables (1 and 2) revealed that G.32 cultivar significantly exceeded the other cultivar G.25 by 145.96 kg/fed. as an

average of the two seasons. These results may be attributed to genetic constitution.

Sole vs. intercropped sesame comparison (C_1) revealed that intercropping between sesame with groundnut significantly reduced the yield of sesame in the first season by about 74.4 kg/fed. lower than sole planting (Table2). These results might be due to the intercompetition between sesame and groundnut for light interception, water and nutrients. The present results are in agreement with those recorded by Ahlwat *et al.* (1986), El-Mihi *et al* (1990) and Gabr *et al.* (1993)

April vs. May plantings of sole sesame (C_2) showed that the early sowing on April 15th produced significantly higher seed yield per feddan than that at late planting on May 15th in both seasons (Table2). Fayed (1974) stated that sowing sesame on April 15th or 30th produced seed yield per hectare higher than that at the late planting date on May 15th. Such effect may be attributed to that early sown crop get sufficient time for growth, before the productive phase set in. Moreover, these results might be also due to, the variation in photoperiod and total number of thermal units accumulated between the time of planting and different physiological maturity (Daynard, 1972). The present results are also in general agreement also with those recorded by (Weiss, 1971; Khidir, 1980; Shalaby *et al.* 1981; Chambi, 1988; Ali, 1994 and El-Serogy, 1998).

Regarding the group comparison (C_3) among the intercropping sesame with groundnut under different sowing sequences, it could be shown that planting sesame on April 15th as the same time as groundnut (S_1G_1) or 30 days before groundnut planting (S_1G_2) gave significantly high seed yield compared with the two other intercropping sowing sequences i.e.,(S_2G_1), in which sesame was planted on May 15th, one month after groundnut and (S_2G_2) planting sesame as the same time as groundnut on May 15th (Table2). These results were in general agreement with those obtained by Gabr *et al.* (1993) in Egypt, who stated that seeding sesame and groundnut at the same time had the best effect on growth and yield of sesame, whereas, delaying the seeding of sesame two week after planting groundnut had the worst effect on

growth and yield of sesame. They also found an increase of 12.90 and 7.04% ; in yield of intercropped sesame with groundnut seeded at the same time and those seeded one week later after groundnut , respectively; over those seeded two weeks after groundnut. The interaction between the sesame cultivars and this group comparison, (V x C_3), was significant in both seasons (Table1). As shown in Table 3 planting G.25 vainly, in April 15th, one month early before groundnut (S_1G_2) tended to outyield the other cropping sequences; While ; for G.32 cultivar, planting both crops together at the same time early in April 15th seemed to be the best cropping sequence.

2- Percentage of Survived Plants:

The means percentages of survived plants and their analysis of variance were given in Tables 1 and 2. It is quite obvious, from these data, that the two sesame cultivars were statistically similar. The intercropping significantly decreased the number of plants per feddan compared with sole cropping. The means of the two systems were 80.3 and 90.0%, as an average of both seasons, respectively. This reduction in the stand of sesame due to intercropping system, may be attributed to the great effect of competition between the two component crops. Similar results were obtained by Badran (1988), who found that intercropped maize with soybean significantly decreased the number of maize plants at harvest compared with the solid maize planting. Sowing date did not affect such trait in both seasons

With respect to the group comparison (C_3), it is clear from Table 2 that the lowest mean was obtained from the intercropping pattern (S_2G_1), in which the sesame sown 30-days after groundnut planting. It seemed that this reduction in sesame stand was attributed to the more competitive effect of groundnut when sown one month earlier than sesame. Also , it seems that the irrigation of groundnut , as a preceding crop, may enhance weed reproduction which add more competitive effect on the late sown sesame; one month later after groundnut .

3 – No. of Fruiting Branches/Plant:

Table 1: Mean squares for the analysis of variance of sesame seed yield (kg/fed.) and yield components as affected by cultivars and cropping patterns in 2000 and 2001 seasons

S. O. V.	df	Trait					
		Seed yield (kg/fed.)		% Survived plants		No. of fruiting branches/plant	
		2000	2001	2000	2001	2000	2001
Replications	3	29249.00	47914.46	1701.00	1002.5	4.03	5.49
Sesame cultivars (V)	1	173280.23*	353976.75*	48 00	5.33	80.08*	76.31*
Error "a"	3	11985.56	16497.47	587.89	381.72	2.48	2.78
Cropping patterns (P)	5	79641.40**	66492.62**	467.20*	536.8*	4.25**	4.43**
$^{+}C_1$	1	58954.59**	15965.04	1014.00*	1014.00*	2.04**	0.36
$^{++}C_2$	1	177030.56**	49284.00**	16.00	144.00	9.00**	10.96**
$^{+++}C_3$	3	54073.95**	89071.35**	435.33*	508.67*	3.41**	3.61**
V x P	5	15907.33**	13066.2*	8.00	4.53	2.81**	2.45**
V x C_1	1	1725.51	13737.74	6.00	2.67	0.60	0.01
V x C_2	1	11502.56	424.36	16.00	4.00	5.76**	5.34**
V x C_3	3	22102.70**	17056.35**	6.00	5.33	2.57**	2.31**
Error "b"	30	3607.49	4268.78	161.11	172.44	0.18	0.24
(C.V%)		13.03	12.94	15.48	15.45	16.96	19.49

$^{+}C_1$ = Sole vs. intercropped sesame plantings .
$^{++}C_2$ = April vs. May planting of sole sesame .
$^{+++}C_3$ = Intercropped sesame with groundnut at different sequences of sowing dates .
* and ** are significant at 5 % and 1% levels, respectively .

Table 1 (cont) : Mean squares for the analysis of variance of sesame seed yield (kg/fed.) and yield components as affected by cultivars and cropping patterns in 2000 and 2001 seasons

S. O. V.	df	Trait					
		Seed yield/plant (g)		Seed index		No. of capsules/plant	
		2000	2001	2000	2001	2000	2001
Replications	3	13.08	24.96**	1.10	1.31	127.43	175.81
Sesame cultivars (V)	1	58.70	44.47**	0.18	0.57	1277.2**	1737.61**
Error "a"	3	1.26	0.47	0.26	0.48	29.06	19.37
Cropping patterns (P)	5	5.75**	4.37**	0.41*	0.38**	1177.49**	1148.58**
$^{+}C_1$	1	6.49**	3.11*	0.03	0.02	284.28**	568.43**
$^{++}C_2$	1	9.42**	7.13**	0.22	0.38 **	1474.56**	1413.76**
$^{+++}C_3$	3	4.28**	3.88**	0.59*	0 .50**	1376.21**	1253.57**
V x P	5	0.37	0.19	0.01	0.03	15.33	5.03
V x C_1	1	0.05	0.02	0.01	0.05	0.08	0.43
V x C_2	1	0.56	0.17	0.003	0.01	1.00	4.00
V x C_3	3	0.36	0.25	0.02	0.03	25.19**	6.91
Error ' b"	30	0.39	0.44	0.16	0.06	6.58	20.52
(C.V%)		8.95	10.39	11.96	7.60	5.41	8.97

$^{+}C_1$ = Sole vs. intercropped sesame plantings
$^{++}C_2$ = April vs. May planting of sole sesame
$^{+++}C_3$ = Intercropped sesame with groundnut at different sequences of sowing dates
* and ** are significant at 5 % and 1% levels, respectively

Table 2 : Means of sesame yield (kg/fed.) and yield components as affected by cultivars, sowing dates and cropping patterns in 2000 and 2001 seasons.

Trait	season	cultivars		Comparisons among cropping patterns								Mean
		G.25	G.32	Sole vs. intercropped sesame (C_1)		April vs. May planting of sole sesame (C_2)		Intercropped sesame at different sequences of sowing dates (C_3)				
				Sole planting	intercropping	S_1	S_2	S_1G_1	S_1G_2	S_2G_1	S_2G_2	
Seed yield (kg/fed.)	2000	(1) 400.9 ^{b}	521.1 ^{a}	510.6 ^{a}	436.2 ^{b}	615.8 ^{a}	405.4 ^{b}	508.4	501.5	341.4	393.6	461.0
	2001	419.2 ^{b}	591.0 ^{a}	530.9 ^{a}	492.2 ^{a}	586.4 ^{a}	475.4 ^{b}	582.3	581.5	377.1	428.1	505.1
% of survived plant	2000	81.0 ^{a}	83.0 ^{a}	88.5 ^{a}	78.8 ^{b}	89.5 ^{a}	87.5 ^{a}	87.5 ^{a}	81.0 ^{a}	70.0 ^{b}	76.5 ^{ab}	82.0
	2001	84.7 ^{a}	85.3 ^{a}	91.5 ^{a}	81.8 ^{b}	94.5 ^{a}	88.5 ^{a}	90.5 ^{a}	84.5 ^{ab}	71.5 ^{b}	80.5 ^{ab}	85.0
No. of fruiting branches/plant	2000	3.8 ^{a}	1.2 ^{b}	2.8 ^{a}	2.4 ^{b}	3.6 ^{a}	2.1 ^{b}	2.8	3.0	1.6	2.1	2.5
	2001	3.8 ^{a}	1.3 ^{b}	2.6 ^{a}	2.5 ^{a}	3.9 ^{a}	1.4 ^{b}	2.9	3.1	1.7	2.2	2.5
Seed yield/plant (g)	2000	5.9 ^{b}	8.1 ^{a}	7.5 ^{a}	6.7 ^{b}	8.3 ^{a}	6.8 ^{b}	7.2 ^{a}	7.5 ^{a}	6.2 ^{b}	6.0 ^{b}	7.0
	2001	5.4 ^{b}	7.4 ^{a}	6.7 ^{a}	6.2 ^{b}	7.4 ^{a}	6.1 ^{b}	6.6 ^{a}	7.0 ^{a}	5.9 ^{b}	5.4 ^{b}	6.4
Seed index	2000	3.4 ^{a}	3.3 ^{a}	3.4 ^{a}	3.3 ^{a}	3.5 ^{a}	3.3 ^{a}	3.5 ^{ab}	3.7 ^{a}	3.1 ^{b}	3.2 ^{b}	3.4
	2001	3.4 ^{a}	3.2 ^{a}	3.4 ^{a}	3.3 ^{a}	3.5 ^{a}	3.2 ^{b}	3.4 ^{ab}	3.6 ^{a}	3.0 ^{c}	3.2 ^{bc}	3.3
No.of capsules/plant	2000	42.3 ^{a}	52.6 ^{a}	50.9 ^{a}	45.7 ^{b}	60.5 ^{a}	41.3 ^{b}	57.5	56.6	33.0	35.8	47.4
	2001	44.9 ^{b}	56.1 ^{a}	54.7 ^{a}	48.4 ^{b}	64.8 ^{a}	44.7 ^{b}	56.7 ^{a}	61.7 ^{a}	35.4 ^{b}	39.7 ^{b}	50.5

(1) Means followed by the same letter (s), within each row for each comparison, are not significantly different at 0.05 level.

Variation in number of fruiting branches per plant, due to the varietal effect, were significant (Table1). Data in Table 2 indicated that the cultivar G.25 significantly exceeded G.32 in both seasons. This may explain the superiority of G.32 cultivar in seed yield/fed. to the other cultivar, G.25. Solid planting tended to increase such trait compared with intercropping. It was clear that early sowing sesame solely on April 15th significantly increased the no. of fruiting branches/plant compared with the late sowing on May 15th (Table 2)

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The interaction between sesame cultivars and sowing dates ($V \times C_2$) had a significant effect on such trait in both seasons. The number of fruiting branches/plant for G.25 cultivar significantly decreased by delaying sowing date in both season. As for G.32 cultivar, the two sowing dates had statistically similar effect on such characteristic in both seasons (Table 4).

Data given in Table 1 show that the interaction among sesame cultivars and the four intercropping sequences ($V \times C_3$), had a highly significant effect on number of fruiting branches/plant, in both seasons. Planting sesame cultivar G.25 early in April 15th, either on month before groundnut (S_1G_2) or at the same time with groundnut (S_1G_1) gave the highest numbers of fruiting branches/plant compared with the other two sequential plantings; S_2G_1 or S_2G_2. The same trend was almost true for G.32 cultivar , yet the differences among the four sequential plantings did not reach the level of significance (Table 3).

4- Seed Yield/Plant (g):

The data in Tables (1 and 2) indicated that the sesame cultivars significantly different in seed yield /plant in both seasons. The mean yield per plant, over the two seasons, were 5.66 and 7.73 g for G.25 and G.32, respectively. As shown from Table2, the solid planting of sesame significantly increased the seed yield/plant by 10.2% , as an average of both seasons, compared with intercropping (C_1). Gabr *et al.* (1993) reported similar results. Also, the earlier solid sesame plantings on April 15th significantly increased seed yield /plant more than the late one on May 15th (C_2). With respect to

different intercropping sowing sequences (C_3), it is quite obvious that early sesame sowing date on April 15th (S_1G_1 and S_1G_2) gave significantly higher means compared with the two other intercropping sowing sequences i.e., S_2G_1 and S_2G_2 (Table2). Gabr *et al.* (1993) came to similar conclusions.

5- Seed Index (g)

Data presented in Table (1) showed that the weight of 1000-seeds was insignificantly affected by cultivars, sole-intercropping (C_1) and sowing dates (C_2). On the other hand, Gabr *et. al.* (1993), found that intercropping sesame with groundnut significantly reduced the weight of 1000 seeds of sesame. However, the differences were significant among the four intercropping sowing sequences (C_3) in both seasons. The mean weights of 1000 seeds for the four sequences i.e., S_1G_1, S_1G_2, S_2G_1, and S_2G_2 were 3.45, 3.62, 3.04 and 3.19 g, as an average of both seasons, respectively (Table2). Gabr *et al.* (1993) obtained similar findings.

6 – No. of Capsules/Plant

Data in Tables 1 and 2 indicated that the varietal differences in number of capsules per plant in both studied seasons were highly significant. From Table 2, it is cleared that the cultivar G.32 had higher mean compared to the cultivar G.25. The intercropping sesame with groundnut significantly decreased the number of capsules per plant in both seasons (C_1). The means, averaged on both season were 52.79 and 47.03 for solid and intercropping plantings, respectively. Gabr *et al.* (1993) reported similar findings. Regarding the effect of sowing dates of solid sesame plantings (C_2), a higher mean recorded for early sowing date on April 15th compared to the late sowing date on May 15th. The interaction between the intercropping sequences and cultivars (V x C_3) was highly significant in the first season only (Table1). Data in Table (3) show that the highest mean was obtained by intercropped sesame cultivar G.32 with groundnut by sowing the two crops simultaneously on the same day on April 15th (S_1G_1), while for G.25 cultivar, the early sowing of sesame , in April 15th , one month before groundnut gave

Table 3: Means of yield, number of fruiting branches/plant and number of capsules/plant as affected by the interaction between sesame cultivars and intercropped sesame with groundnut at different sowing sequences (V x C_3) in 2000 and 2001 seasons

cultivar	Intercropping sowing sequence	Traits				
		Seed yield (kg/fed.)		No. of fruiting branches/plant		No. of capsules/plant
		2000	2001	2000	2001	2000
G.25	S_1G_1	454.3 $^{a(1)}$	452.0 ^{b}	4.3 ^{a}	4.4 ^{a}	49.8 ^{b}
	S_1G_2	502.3 ^{a}	563.0 ^{a}	4.8 ^{a}	4.9 ^{a}	53.0 ^{a}
	S_2G_1	215.3 ^{c}	313.0 ^{c}	2.1 ^{c}	2.2 ^{c}	27.8 ^{d}
	S_2G_2	349.8 ^{b}	345.0 ^{c}	3.1 ^{b}	3.3 ^{b}	31.4 ^{c}
	Mean	380.4	418.3	3.6	3.7	40.5
G.32	S_1G_1	562.5 ^{a}	712.0 ^{a}	1.3 ^{a}	1.4 ^{a}	65.1 ^{a}
	S_1G_2	500.8 ^{ab}	600.0 ^{b}	1.2 ^{a}	1.3 ^{a}	60.1 ^{b}
	S_2G_1	467.5 ^{b}	441.2 ^{c}	1.1 ^{a}	1.1 ^{a}	38.2 ^{c}
	S_2G_2	437.5 ^{b}	511.1 ^{bc}	1.0 ^{a}	1.0 ^{a}	40.1 ^{c}
	Mean	492.1	566.1	1.2	1.2	50.9

(1) Means followed by the same letter(s) for each sesame cultivar, for each season for each trait, are not significantly different at 0.05 level.

Table 4: Mean number of fruiting branches/sesame plant as affected by the interaction between cultivars and sowing dates of sole sesame planting (V x C_2) in 2000 and 2001 seasons.

Season	cultivar	Dates of sole sesame plantings		Mean
		April 15th	May 15th	
2000	G.25	5.6 $^{a(1)}$	2.9 ^{b}	4.3
	G.32	1.5 ^{a}	1.2 ^{a}	1.4
	Mean	3.6	2.1	2.8
2001	G.25	5.3 ^{a}	1.6 ^{b}	3.5
	G.32	2.5 ^{a}	1.1 ^{a}	1.8
	Mean	3.9	1.4	2.6

(1)Means followed by the same letter(s), for each cultivar in each season, are not significantly different at 0.05 level.

the highest number of capsules / plant (S_2G_1). The present results were in harmony with those of Gabr *et al.* (1993).

REFERENCES

Abdel-Aal, S. M.; M.A. Ebaid and Sh. H. Mohamed.(2000[a]). Growth, yield, seed quality and land use efficiency for some soybean and sunflower varieties as affected by intercropping. Proc. 9th Conf. Agron., Minufia Univ,Shebin El-Kom, Egypt. 1-2 Sept.: 649-662.

_____.; L.Kh. Mohamad and Sh. H. Mohamed.(2000[b]). Effect of intercropping maize with sunflower on their growth, yield, chemical compostion and land production efficiency. Proc. 9th Conf. Agron., Minufia Univ,Shebin El-Kom, Egypt. 1-2 Sept.: 635-647.

Ahlawat, R. P. S.; D. R. Padmani and k. D. Lodola. (1986). Relay cropping in groundnut. Ind. J. of Agron. 31: 289 – 292.

Ali, A. A. (1994). Effect of planting dates, N. and P. fertilization in reclaimed desert land on sesame (*Sesmum indicum* L.,). Menofiya J. Agric. Res., 19: 109 – 123.

Assey, A. A. ; O. A. A. Zeiton ; A. A. H. El-Khawga and A. I. Abdel Hameed. (1992). Yield of intercropped corn and soybean as affected by fertilization and maize populations density. IV- competition relationships. Proc. 5th Conf. Agron., Zagazig, 13-15 Sept., II: 575-587.

Badran, M. S. (1988). Studies on intercropping maize with soybean. M. Sc. Thesis, Alex. Univ., Egypt.

_____. (1994). Intercropping maize with soybean under mechanized farming. Ph.D. Thesis, Alex. Univ., Egypt.

Chambi, J. Y. (1988). Sesame research in Tanzania. In oil crops, sunflower, Linseed and Sesame. Proc. 4th oil Crops Network Workshop held at Njaro, Kneya, 25-29 January (A. Omran ed.) IDRC Manuscript Repent 205e. (Cited after Ali, 1994)

Desal, N. B. and S. N. Goyal . (1980). Intercropping of sesame with other oil seed crops. Indian J. Agric. Sci. 50: 603-605.

Dyanard, T. B. (1972). Relationships among black-layer formation, grain moisture percentage and heat unit accumulation in corn. Agron. J. 64: 716-719.

El-Khawaga, A. A. H.; E. M. A. Thabet and E. S. S. Sobieh . (1992). Effect of irradiation on both sesame (*Sesamum indicum*, L.) and groundnut (*Arachis hypogea*, L.) under intercropping system. Proc. 5th Conf. Agron.,Zagazig, 13-15 Sept., 2 : 597-608.

El-Mihi, M. M.; A. S. El-Gamel ; M. A. El-Massry and A. S. Kamel . (1990). Growth and yield of sesame and groundnut in monoculture and association under different patterns and plant spacing. Proc. 4th Conf. Agron., Cairo; 15-16 Sept., II; 571-580.

El-Serogy, S. T. (1998). Effect of thinning time, Nitrogen application and sowing dates on sesame yield under Middle Egypt conditions. Egypt. J. Agric. Res., 76: 639-650.

Fayed, M. M. (1974). Effect of some cultural treatments on yield, some agronomic characters and chemical constituents of seeds in sesame (*Sesamum inicum* L.) Ph. D. Thesis, Al Azahar Univ., Egypt.

Gabr, E. M. A . (1998). Effect of preceding winter crops and Potassium fertilizer levels on growth and yield of intercropped peanut and sesame in new sandy soils. Proc. 8th .Conf. Agron., Suez. Canal Univ., Ismailia, Egypt, Nov. 28-29th: 553-560.

_____; I. O. E. Metwally and N. A. EL-Hawary . (1993). Effect of different patterns of intercropping seame with groundnut in sandy soils. J. Agric. Sci. Mansoura Univ. 18: 3420-3425.

Galal, S. Jr.; M. M. F. Abdalla and A. A.Metwally . (1983). Intensifying land and the nutritive equivalent ratios through intercropping matching pairs of corn and soybean cultivars in Egypt. Int. Sump. on soybean, Agric., forest and fisheries Res. Coun., Min. Agric. Forest and Fish., Japan, Sept. 26th October 1st 101-106.

Khidir, M. O. (1980). Sesame production in the Sudan. Experte consultation on sesame Improvement, Rome 8-12 Dec.

Mohamed, H. M. H.; H. A. Abd-El-Aal and A. M. El-Shinnawy . (1986). Effect of intercropping maize with cotton on plant height, yield and yield components of cotton. Proc. 2nd Conf. Agron., Alex., Egypt; 2 : 263-271.

Sahlaby, A. A.; M. A. El-fawal; A. A. Abdel-Bary and Y. H. Khalil . (1981). The effect of planting date and nitrogen fertilization on yield and yield complements of sesame. Alex. J. Agric. Res.29: 83 – 88.

Sharma, S.K. and M. K. Mevsingh . (1987). Intercropping of oilseed crops with groundnut in drought brone region of semi arid zone. J. of oil seed Res. 4 : 175-184.

Snedecor, G. W. and W. G. Cochran . (1967). Statistical methods. 6th Ed. Iowa State Univ. Press., Iwoa, U.S.A.

Weiss, E. A. (1971). Castor, sesame and safflower. Leonard Hill Books, London.

الملخص العربي

مقارنة الزراعة المنفردة و التحميل للسمسم و الفول السوداني المنزرعين في تتابعات مختلفة من مواعيد الزراعة

١ – محصول السمسم و مكوناته

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نظرا لندرة الأبحاث المنشورة عن أثر التتابعات المختلفة من مواعيد الزراعة لمحصولي السمسم و الفول السوداني عند تحميلهما معا ، فإن الهدف من هذه الدراسة ينحصر فى الحصول على مزيد من المعلومات الإضافية لأنسب هذه التتابعات حيث استخدم في هذه الدراسة الصنفان (جيزة ٢٥ ، جيزة ٣٢) من السمسم و صنف الفول السوداني جيزة ٥ حيث تمت زراعتهم منفردين و محملين معا في ميعادي الزراعة (١٥ أبريل ، ١٥ مايو) لكلا المحصولين . و قد استخدم تصميم القطع المنشقة مرة واحدة بأربعة مكررات حيث خصصت القطع الرئيسية لصنفي السمسم بينما رتبت المعاملات الستة لنظم الزراعة (معاملتين من السمسم منفردا ، أربعة تتابعات لنظم مختلفة من التحميل) في القطع الفرعية .

أوضحت نتائج هذه الدراسة أن الصنف جيزة ٣٢ قد تفوق معنويا على الصنف جيزة ٢٥ في محصول البذور / فدان و محصول النبات الفردي في كلا الموسمين و كذا عدد الكبسولات / نبات في الموسم الثاني في حين حدث العكس بالنسبة لعدد الأفرع الثمرية / نبات حيث تفوق الصنف جيزة ٢٥ على الصنف جيزة ٣٢ ، بينما لم يختلف الصنفان إحصائيا عن بعضهما في صفتي نسبة النباتات المتبقية عند الحصاد ، و معامل البذرة في كلا موسمي الدراسة.

اتجه التحميل إلى أحداث نقص لمتوسطات جميع الصفات التي تم دراستها ، كما أدت زراعة السمسم منفردا في ١٥ أبريل إلى حدوث زيادة معنوية في المحصول و مكوناته باستثناء صفتي (نسبة النباتات المتبقية عند الحصاد في كلا موسمي الدراسة ، و معامل البذرة في الموسم الأول) و ذلك مقارنة بزراعته منفردا في ١٥ مايو .

كان هناك تفاعلا معنويا بين صنفى السمسم غير المحملين وميعادى الزراعة في كلا موسمي الدراسة و ذلك بالنسبة لصفة عدد الأفرع الثمرية / نبات ، بينما كان التفاعل بين صنفى السمسم و نظم التحميل معنويا في الموسمين و ذلك بالنسبة لصفتي المحصول البذري للفدان و عدد الأفرع الثمرية / نبات في حين كان هذا التفاعل معنويا في الموسم الأول فقط بالنسبة لصفة عدد الكبسولات / نبات .