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EFFECT OF DIFFERENT INTERCROPPING SYSTEMS ON PRODUCTIVITY OF MAIZE AT INTERPLANTING WITH SESAME BY DIFFERENT SEQUENCES OF SOWING DATES FOR BOTH CROPS UNDER NEWLY CULTIVATED SANDY SOIL

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ABSTRACT

The present investigation was carried out in newly cultivated sandy soil during the two successive summer seasons 2004 and 2005 at the Experimental farm of the Faculty of Damanhour Agriculture , Alexandria University at El-Boustan region , El – Behera Governorate . This investigation was designed to determine the suitable intercropping system and the convenient sequence of sowing for maize at intercropped with sesame under newly cultivated sandy soil. Maize cultivar Three Way Cross 310 (TWC 310) and sesame variety Giza 32 (G.32) were interplanted under three different intercropping systems and combination of two sequences of sowing dates for both crops. The three intercropping systems were : the same ridge , as well as alternate ridges 1:1 and 2 : 2 while , the sequences of sowing dates were April 20th and May 20th for both crops, as well as two solely maize plantings at each of the two assigned sowing dates. A split– plot design in a randomized complete block arrangement with four replicates , was used. The three intercropping systems were assigned to the main plots, where the six cropping patterns were randomly arranged in the sub-plots.The data obtained revealed that intercropping systems highly significantly affected no. of green leaves / plant (in the first season), the upper – ear most leaf area; in both seasons, 50% silking date, plant height and ear diameter (in the second season) and only significant affected on 50% silking date, (in first

season) no. of rows / ear , one hundred kernel weight , grain weight / plant and grain yield / ha (in the second season). All the studied traits ; namely, 50% silking date, no of green leaves / plant, the upper – ear most leaf area, plant height , 1st ear height, ear diameter , ear length , no of rows / ear , one – hundred kernel weight , grain weight / plant, shilling % and grain yield / ha were highly significantly effected by cropping patterns, in both studied seasons .No significant effect of intercropping systems x cropping patterns interaction was observed on the studied traits , in both seasons . This study recommended to intercrop maize with sesame by using the same ridge intercropping system and sowing both crops simultaneously on the same day , in 20th of May (M_2 S_2) under newly cultivated sandy soil to produce good production of maize grain yield and addition sesame seeds yield in this region (El- Boustan area).

INTRODUCTION

In developing countries , where the cultivated land is limited at the rapid increase of population continuously reduces the per capita acreage of this cultivation land (in Egypt it is about 0.04 ha / capita Metwally *et al,* 2005). Intercropping may be considered one of the most important ways to increase the productivity of unit area. In the concern , many researchers stated that intercropping is recommended to increase profitability for Egyptian farmers (Badran, 1988; Badran , 1994; Metwally, 1999; Abdel-Aal, *et al* (a & b), 2000; Badran, (a & b & c) 2002; Metwally *et al.,* 2003 and Metwally *et al.,* 2005).

Maize (*Zea mays L.*) is considered as one of the most important strategic creals summer crop in Egypt. Maize grains is used on a large scale for both human and animal consumption . The local production of this crop is insufficient to meet the continuous increase of the consumption . Therefore, our government try attempts to increase maize production Such attempts could be achieved through horizontal and vertical expansion for this crop.

Maize and sesame crops are commonly suggested as desirable intercrop species because their different growth rate of the spacing should allow full utilization of the environment competition for light

. So , intercropping both crops, under newly cultivated sandy soil conditions is considered a convenient practice which may lead to reduce labour peaks, minimize crop failure risk, reduce the adverse effect of pests , provide higher returns and finally , save water irrigation .

Little information is available about the effect of optimum package recommendation for intercropping maize with sesame under newly cultivated sandy soil. The aim of the present investigation was designed to study the effect of three different (maize / sesame) intercropping systems even they interplanted together at two combination of sowing dates under newly cultivated sandy soil conditions on maize productivity .

MATERIALS AND METHODS

This investigation was carried out at the Experimental Farm of El-Boustan , Faculty of Agriculture, Damanhour , Alexandria University during 2004 and 2005 summer seasons. The aim of this investigation was to study the effect of three (maize / sesame) intercropping systems and six cropping patterns on some agronomic traits, yield and its components of Three Way Cross 310 cultivar (TWC 310) . The three intercropping systems were : the same ridge , as well as alternate ridges 1:1 and 2 : 2 while , the six cropping patterns were four intercropping patterns of combination of April 20^{th} May 20^{th} sowing dates, for both crops, as well as two solely maize plantings at each of the two assigned sowing dates. The six cropping patterns were follows :

1- Maize and sesame were interopped simultaneous sowing on the same day , in 20^{th} of April (M_1S_1).
2- The two crops were intercropped by simultaneous sowing on the same day, but in 20^{th} of May (M_2S_2).
3- Early sowing of maize in 20^{th} of April , was followed by intercropping sesame sown at 20^{th} of May (M_1S_2) .
4- Early sowing of sesame in 20^{th} of April , was followed by intercropping maize sown at 20^{th} of May (M_2S_1) .
5- Sowing maize as sole crop in 20^{th} of April , (M_1).
6- Sowing maize as sole crop in 20^{th} of May , (M_2).

The experimental design was split plot with four replications. The intercropping systems were assigned randomly to the main plots, where the cropping patterns distributed randomly in the sub- plots. Each sub-plot was consisted of eight ridges spaced 60 cm apart with three meters long . Sesame Giza 32 variety (G 32) were mixed with sand during sowing for better seeds distribution. Regarding, the sole plantings as well as the same ridge intercropping system, maize grains were sown on the northern side of the ridge, while sesame seeds occupied the other southern side but in the two another intercropping systems both crops were sown on both sides of ridges . The plant population / ha of maize and sesame were about to 42000 and 224000 plants/ha, respectively. The two respective plant populations were maintained through thinning maize seedlings to one plant / hill spaced 40 cm apart and sesame in two plants / hill spaced 15 cm apart .

Both nitrogen fertilizer as ammonium sulphate (20.6 %N) and potassium fertilizer, as potassium sulphate (48 % K_2O) at rates of 116 and 115.5 kg/ha, respectively, were side – dressed at two equal doses. Half of the amount was added at the first irrigation and the rest was applied in both sole cropping and simultaneously intercropping. While for the sequential intercropping treatments, in which the two crops were sowing at two different dates , the first application of both nitrogen and potassium fertilizers was added at sowing irrigation of the latest planted crop, while , the second dose was applied at the subsequent irrigation. In additions phosphorus fertilizer in from of ordinary super phosphate (15.5 % P_2O_5) was broadcasted during soil preparation, at a rate of 74 kg P_2O_5 / ha.

All other cultural practices, recommended for El-Boustan region , were applied for both crops. The data recorded were taken on the four inter ridges of each sub-plot in both seasons for 50% sulking date (number of days from sowing to 50 % emergence silking). Both plant and upper ear height (cm) were measured from soil surface to the tip of the tassel and the upper most – ear node, respectively, on ten guarded plants from each plot at full flowering. The upper most – ear leaf area (cm^2) was measured according to Montogomery (1911) . on randomly ten guarded plants from each sub-plots at full flowering using the following formula :

Leaf area of blade = Length x maximum width x 0.75 .

At full tassiling, samples of ten plants were randomly taken from each sub-plot to measure the number of green leaves / plant .At harvest , the following data were recorded on ten individual plants at random : ear diameter (cm) , ear length (cm), number of rows / ear , grain weight / plant (g) and shelling percentage. Grain yield (ton/ha) was recorded on the four inter ridges of each sub-plot bases and adjusted to 15.5 % grain moisture content .

With regarded to intercropping systems, two orthogonal comparisons were done i.e.,(C_1) : the same ridge intercropping system vs. the two alternate intercropping systems and (C_2) : 1:1 alternate ridges of intercropping system vs. (2:2) alternate ridges of intercropping system.

On the otherhand , another three orthogonal comparisons were done among the six cropping patterns i.e., sole vs. intercropped maize plantings (C_3) , April vs. May plantings of sole maize (C_4) and intercropped sesame with maize at different sequences of sowing date, (C_5) Also ,another three orthogonal comparisons were done between intercropping systems (I) × C_3 , C_4 and C_5 .

Date were statistically analysed according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

1- Effects of intercropping systems :

The analysis of variance for the effect of intercropping systems on the studied traits of maize plants in 2004 and 2005 seasons are presented in Table 1. The results showed either significant or highly significant effects for the three studied intercropping systems, either in one or both seasons, on most of studied traits .

Concerning the same ridge intercropping system vs. alternate intercropping systems (C_1), data in Table (1) revealed that, both two different systems significantly differing in both seasons on 50 % silking date, no. of green leaves/ plant , the upper ear most leaf area, plant height and ear diameter. On the otherhand , the differences were significant for both 1st ear height and ear length (in first season) , meanwhile, no. of rows / ear , one hundred – kernel weight , grain weight / plant and grain yield / ha, in the second season .

It could be shown that, interplanted maize with sesame on the same ridge significantly superior for the above mentioned traits, compared with the alternate ridges (Table 2). On the other hand, alternate ridges were significantly superior for plant height (in both seasons) and 1st ear height (in the first season) compared with the same intercropping system. This results may be due to the different distributing of maize plants under the two intercropping systems, where under alternating ridges, maize plants occupied one half of the cultivated area and so, the intercompetion among maize plants may by become more compared with the another system i,e., the same ridge of intercropping .

Results in Table 2 exhibited that the average of grain yield / ha for same ridge intercropping systems and alternate ridge of intercropping systems were 5.62 and 4.99 ton / ha. Therefore, the same ridge of intercropping increased the maize grain yield by about 12.63 % over both seasons compared with alternate ridge of intercropping . In this concern, Metwally *et al.*,(2005) , intercropped maize with soybean. in alternating and mixed intercropping systems and reported that maize grain yield / ha was higher by about 10% under alternating ridges of intercropping pattern comparing with mixed intercropping.

2- Effect of cropping patterns:

The results presented in Table (1) indicated that cropping patterns had highly significant effect on all studied traits of maize plant in both studied seasons , i.e. 50% silking date , no. of green leaves / plant , upper ear – most leaf area, plant height, 1st ear height , ear diameter, ear length, no. of rows / ear , one – hundred kernel weight , grain weight / plant, shelling % and grain yield / ha .

With respect to sole vs. intercropped maize (C_3) , the results reveled either significant or highly significant differences in both seasons between the two cropping patterns in all studied traits except no. of green levees / plant (Table 1).

Solid plantings of maize had highest significant means of 50% silking date, upper – ear most leaf area , plant height, 1st ear height, ear diameter , ear length , no. of rows / ear , one- hundred kernel weight , grain weight / plant , shelling % and grain yield / ha by about 3.07 , 9.46 , 8.11 , 7.04 , 4.92 , 5.90, 11.48, 3.18 , 7.42 , 2.58 and 15.79 % respectively , over both seasons, than intercropping (Table 2).

Table (1) : Mean squares for the analysis of variance of some agronomic traits for maize crop, grain yield (ton / ha.) and yield components as affected by intercropping systems and cropping patterns in 2004 and 2005 seasons .

S.O.V	df	Trait							
		50 % silking date (day)		No. of green leaves/plant		The upper-ear must leaf area (cm^2)		Plant height (cm)	
		2004	2005	2004	2005	2004	2005	2004	2005
Replications	3	8.15	2.84	6.76	6.93	3699.7	18966.19	15.00	789.00
Intercropping systems (I)	2	54.89*	66.89**	27.14**	24.00	164288.89**	167314.67**	4013.56	5208.00**
The same ridge vs alternate ridge (c_1)	1	69.44*	93.44**	47.38**	36.00*	266944.44**	268324.00**	6346.78*	6084.00**
The alternate ridges (1:1) vs (2:2),c_2	1	40.33*	40.33**	6.90	12.00	61633.33*	66305.33*	1680.33	4332.00**
Error "a"	6	5.37	2.65	2.24	5.98	5908.37	7536.89	1044.78	388.56
Cropping patterns (P)	5	51.95**	75.56**	8.17**	5.93**	48488.89**	43040.00**	4115.56**	5881.60**
+c_3	1	40.11**	75.11**	2.05	6.25	38677.78**	33856.00*	4138.78**	5844.00**
+ + c_4	1	66.67**	96.00**	19.08**	3.53	56066.67**	58410.67*	1872.67*	2730.67**
+++ c_5	3	51.0**	68.89**	6.58**	6.63**	49100.00**	40977.78**	4855.44**	6277.78**
I X P	10	2.56	0.49	0.59	0.40	528.89	1266.67	458.62	160.00
I X c_3	2	2.78	0.70	0.84	0.12	1344.44	784.00	266.78	196.00
I X c_4	2	0.67	0.08	0.04	0.17	66.67	530.67	8.67	21.00
I X c_5	6	2.78	0.56	0.70	0.56	411.11	1672.89	672.56	194.45
Error " B"	45	4.52	3.11	1.11	1.55	5018.37	8087.31	448.41	358.17
C.V %		3.51	2.79	8.99	9.59	14.20	16.69	11.02	9.00

+ c_3 = Solo vs . intercropped maize plantings.
+ + c_4 = April vs. May planting of solo maize .
+++ c_5 = Intercropped maize with sesame at different sequences of sowing dates.
* and ** are significant at 5% and 1% levels, respectively .

Table (1) : cont.

S.O.V	df	Trait							
		1st ear height (cm)		Ear diameter (cm)		Ear length (cm)		No.of rows / ear	
		2004	2005	2004	2005	2004	2005	2004	2005
Replications	3	21.37	828.78	0.34	0.16	11.03	5.89	3.97	0.96
Intercropping systems (I)	2	1400.00	2848.67	2.87	5.04**	67.92	34.33	4.52	48.44*
The same ridge vs alternate ridge (c_1)	1	2500.00*	3721.00	4.84*	9.00**	129.96*	66.69	6.42	78.62*
The alternate ridges (1:1) vs (2:2),c_2	1	300.00	1976.33	0.91	1.08	5.88	1.77	2.61	18.25
Error "a"	6	373.70	668.72	0.75	0.34	18.65	15.25	3.34	8.45
Cropping patterns (P)	5	894.93**	1938.53**	0.46**	0.55**	11.19**	12.23**	13.43**	12.97**
+ c_3	1	841.00*	1936.00*	0.53*	0.56**	12.96*	27.74**	31.73**	13.44**
+ + c_4	1	1014.00*	1600.67*	0.68*	0.74**	9.63	4.86	18.03**	24.00**
+++ c_5	3	873.22**	2052.00**	0.39*	0.49**	11.12*	9.52	5.80**	9.14**
I X P	10	14.13	124.4	0.03	0.03	0.81	0.63	0.62	0.85
I X c_2	2	1.00	64.00	0.03	0.02	0.20	0.87	0.53	0.23
I X c_4	2	26.0	20.67	0.03	0.03	0.05	0.42	0.19	0.74
I X c_5	6	14.56	179.11	0.02	0.03	1.26	0.62	0.79	1.09
Error " B"	45	200.61	288.56	0.11	0.03	3.10	3.52	0.68	0.73
C.V %		11.04	12.12	8.90	4.12	8.98	9.73	8.88	7.42

+ c_3 = Sole vs . intercropped maize plantings.
+ + c_4 = April vs. May planting of sole maize .
+++ c_5 = Intercropped maize with sesame at different sequences of sowing dates.
* and ** are significant at 5% and 1% levels, respectively .

Table (I) : cont.

S.O.V	df	Trait							
		One hundred kernel weight (g)		Grain weight / plant (g)		Shelling %		Grain yield (t/ha.)	
		2004	2005	2004	2005	2004	2005	2004	2005
Replications	3	1.29	2.36	87.22	799.20	5.59	55.33	1.63	9.63*
Intercropping systems (I)	2	4.86	24.00*	1952.89	1664.0*	36.72	24.00	1.61	6.57*
The same ridge vs alternate ridge (c_1)	1	7.11	36.00*	3528.44*	3136.0*	66.69	36.00	2.51	11.49*
The alternate ridges (1:1) vs (2:2),c_2	1	2.61	12.00	385.33	192.0	6.75	12.00	0.72	1.66
Error "a"	6	8.67	3.40	533.44	273.73	30.98	22.61	0.82	1.10
Cropping patterns (P)	5	13.81**	17.70**	1134.88**	1658.13**	35.82**	41.87**	5.49**	4.55**
+ c_3	1	15.73*	17.64**	2146.78*	1764.0*	66.69*	49.50**	10.85**	8.82**
+ + c_4	1	25.63**	15.36**	384.0	1066.67	48.17*	16.67	3.87*	3.62**
+++ c_5	3	9.23*	18.56**	1946.56*	1806.67**	21.42*	46.56**	4.24*	3.43**
I X P	10	0.83	1.06	19.82	83.73	11.86	5.07	0.10	0.13
I X c_3	2	0.05	0.81	40.11	81.00	24.18	6.25	0.01	0.01
I X c_4	2	0.01	0.18	0.34	40.67	11.17	0.67	0.04	0.04
I X c_5	6	0.82	1.44	18.22	99.00	7.98	6.14	0.18	0.18
Error " B"	45	2.30	0.86	314.57	387.47	9.76	5.61	0.63	0.42
C.V %		4.76	2.73	11.72	12.81	4.32	3.12	16.81	11.39

+ c_3 = Sole vs . intercropped maize plantings.
+ + c_4 = April vs. May planting of sole maize .
+++ c_5 = Intercropped maize with sesame at different sequences of sowing dates.
* and ** are significant at 5% and 1% levels, respectively .

Table (2) : Means of maize grain yield (t / ha.), some agronomic traits and yield components as affected by (Maize / sesame) intercropping systems and cropping patterns in 2004 and 2005 seasons .

Trait	Season	Comparisons among intercropping systems				Comparisons among cropping patterns								Mean
		Same ridge vs. alternate ridges (c_1)		(1:1) alternate vs (2:2) alternate ridges (c_2)		Sole vs intercropped maize (c_3)		April vs. May planting of sole maize (c_4)		Intercropped maize with sesame at different sequences of sowing dates (c_5)				
		Same ridge	Alternate ridges	(1:1) alternate ridge	(2:2) alternate ridge	Sole planting	Inter-cropping	M_1	M_2	M_1S_1	M_1S_2	M_2S_1	M_2S_2	
50 % silking date (day)	2004	62.00 a[1]	59.92 b	60.83 a	59.00 b	61.67 a	60.08 b	63.33 a	60.00 b	63.00 a	60.00 b	59.00 c	58.33 c	60.61
	2005	64.83 a	62.42 b	63.33 a	61.50 b	64.67 a	62.50 b	66.67 a	62.67 b	65.67 a	63.00 b	61.00 c	60.33 d	63.22
No .of green fever/plant	2004	12.87 a	11.15 b	11.53 a	10.77 a	11.96 a	11.60 a	11.07 b	12.85 a	11.33 c	10.73 d	11.87 b	12.47 a	11.73
	2005	14.00 a	12.50 b	13.00 a	12.00 a	13.42 a	12.79 a	13.03 a	13.80 a	12.37 c	11.97 c	13.33 b	13.50 a	13.00
The upper ear most leaf area (cm^2)	2004	585.00 a	455.83 b	491.62 a	420.00 b	531.67 a	482.50 b	483.33 b	580.00 a	418.00 d	458.00 c	550.00 a	528.00 b	498.89
	2005	625.00 a	495.5o b	532.67 a	458.33 b	569.33 a	523.33 b	520.00 b	618.67 a	460.00 b	490.00 b	586.67 a	556.67 a	538.67
Plant height (cm)	2004	178.83 b	198.75 a	192.83 a	204.67 a	202.83 a	186.75 b	194.00 b	211.67 a	172.67 b	166.33 b	202.67 a	205.33 a	192.11
	2005	195.00 b	214.58 a	205.00 b	224.00 a	218.33 a	202.83 b	207.67 b	229.00 a	191.67 b	176.00 c	228.67 a	223.00 a	208.00
1st ear height (cm)	2004	120.00 b	132.50 a	130.00 a	135.00 a	133.17 a	125.92 b	126.67 b	139.67 a	122.67 c	115.33 d	133.00 a	132.67 a	128.33
	2005	130.00 a	145.25 a	138.83 a	151.67 a	147.50 a	136.50 b	139.33 b	155.67 a	132.67 b	119.67 c	146.00 a	147.67 a	140.17
Ear diameter (cm)	2004	4.02 a	3.47 b	3.61 a	3.33 a	3.78 a	3.59 b	3.62 b	3.93 a	3.53 b	3.37 c	3.70 a	3.78 a	3.65
	2005	4.78 a	3.95 b	4.10 a	3.8 a	4.33 a	4.14 b	4.15 b	4.50 a	4.03 c	3.92 d	4.23 b	4.37 a	4.28

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

Table (2) : cont .

Trait	season	Comparisons among intercropping Systems				Comparisons among cropping patterns								Mean
		Same ridge vs. alternate ridges (c_1)		(1:1) alternate vs (2:2) alternate ridges (c_2)		Sole vs intercropped maize (c_3)		April vs. May planting of sole maize (c_4)		Intercropped maize with sesame at Different sequences of sowing dates (c_5)				
		Same ridge	Alternate ridges	(1:1) alternate ridge	(2:2) alternate ridge	Sole planting	Inter-cropping	M_1	M_2	M_1S_1	M_1S_2	M_2S_1	M_2S_2	
Ear length (cm)	2004	21.78 a[1]	18.85 b	19.20 a	18.50 a	20.40 a	19.50b	19.77 a	21.83 a	18.87 b	18.5 b	20.17 a	20.47 a	19.80
	2005	20.65 a	18.59 a	18.78 a	18.40 a	20.15 a	18.83 b	19.70 a	20.60 a	18.30 a	18.13 a	18.80 a	20.10 a	19.27
No .of rows / ear	2004	9.82 a	9.18 a	9.43 a	8.95 a	10.33 a	8.93 b	9.47 b	11.28 a	8.06 c	8.73 b	9.28 a	9.70 a	9.39
	2005	13.00 a	10.78 b	11.40 a	10.17 a	12.13 a	11.23 b	11.13 b	13.13 a	10.67 c	10.30 d	11.77 b	12.13 a	11.52
One-hundred kernel weight (g)	2004	32.32 a	31.65 a	31.88 a	31.40 a	32.53 a	31.54 b	31.50 b	33.57 a	31.00 c	30.67 e	32.6 a	31.90 b	31.87
	2005	34.00 a	32.50 b	33.00 a	32.00 a	33.70 a	32.65 b	32.90 b	34.50 a	32.00 c	31.27 d	34.00 a	33.33 b	33.00
Grain weight /Plant (g)	2004	161.17 a	146.33 b	149.17 a	143.50 a	159.00 a	147.42 b	155.00 a	163.00 a	149.67 b	137.67 c	143.00 c	159.33 a	151.28
	2005	163.00 a	149.00 b	151.00 a	147.00 a	160.67 a	150.17 b	154.00 a	167.33 a	145.67 b	135.00 c	150.00 a	162.00 a	153.67
Shelling %	2004	73.75 a	71.71 a	72.00 a	71.33 a	73.75 a	71.71 b	72.33 b	75.17 a	71.33 b	70.00 c	72.50 a	73.00 a	72.39
	2005	77.00 a	75.50 a	76.00 a	75.00 a	77.17 a	75.42 b	76.33 a	78.00 a	74.66 b	73.00 c	77.33 a	76.67 a	76.00
Grain yield (t / ha)	2004	4.98 a	4.58 a	4.70 a	4.46 a	5.26 a	4.44 b	4.86 b	5.66 a	4.41 b	4.29 b	3.81 c	5.24 a	4.71
	2005	6.25 a	5.40 b	5.59 a	5.22 a	6.18 a	5.44 b	5.79 b	6.57 a	5.27 c	4.79 d	5.64 b	6.05 a	5.69

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

These results might be attributed to low density in solid maize plantings is higher more light interception, water and nutrients than intercropping culture. The obtained results are in harmony with the findings of Sayed Galal *et al.*, 1983; Elmore and Jackbos 1984; Abdel-Gawad *et al.*, 1985; Badran, 1988; Attia and Bially, 1990; Badran, 1994; Abdalla *et al.*,1999; Metwally, 1999, Metwally *et al.*, 2003 and Metwally *et al.*,2005.

April vs. May plantings of sole maize (C_4) revealed either significant or highly significant differences for all studied traits, in both seasons , except no of green leaves / plant (in the second season) , ear length (in both seasons) , grain weight / plant (in both seasons) and shelling % (in the second season) as shown in Table 1. The late sowing of maize on May push plant to became more earlier flowing and higher means for the another studied traits, compared with the early sowing date on April as shown in Table 2. The increase of grain yield , yield components and another studied agronomic traits by sowing maize on May might be due to environmental conditions in this period which seems to be suitable for translocation the nutrient to grains. These results were similar to those of Shalaby and Mikhail (1979 a, b and c) and Badran (1988) who reported that May plantings are considered as the optimum dates for sowing maize in Egypt.

Regarding the group comparison (C_5) among the intercropping maize with sesame under different sequences of sowing dates it could be shown that the all studied traits significantly affected in both seasons, expect ear length in the second season Table 1 . Data in Table (2) revealed that sowing maize on April as the same time as sesame (M_1S_1) significantly later flowering date compared with the three other intercropping sowing sequences i.e.,(M_1S_2), in which maize was sowing on April , one month before sesame , (M_2S_1) sowing maize on May , one month after sesame and (M_2S_2) sowing maize as the same time as sesame on May. This result may be due to maize plant, efficiency in solar energy conversion into chemical energy induced earlier beginning of flowing . With respect to all the another studied trails ,i.e., no. of green leaves / plant , the upper ear most leaf area ,plant height, 1st ear height , ear diameter , ear length, no. of rows / ear, one - hundred kernel weight, grain weight / plant shelling % and grain yield / ha , it is clear from Table 2 that the highest means was obtained from the intercropping pattern (M_2S_2) , in which the maize

sown as the same time as sesame on May, Except , the upper ear most leaf area (in 2004) and one hundred kernel weight (in both seasons) where the highest means were obtained from pattern (M_2S_1) , in which the maize sown on May 30 day after sesame .

3- Effect of the interactions:

The interaction between the three intercropping systems and six cropping patterns was insignificant for all maize studied traits in both seasons Table (1).

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الملخص العربي

تأثير أنظمة مختلفة من التحميل على إنتاجية الذرة الشامية حال تحميله مع السمسم بزراعتهما معاً في تتابعات مختلفة من مواعيد الزراعة في الأراضي الرملية حديثة الاستزراع

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أجريت الدراسة الحالية في أرض رملية حديثة الاستزراع ، خلال صيف موسمي 2004 & 2005م بمحطة البحوث والتجارب الزراعية لكلية زراعة دمنهور – جامعة الإسكندرية – بمنطقة البستان – محافظة البحيرة ، وقد صممت هذه الدراسة بهدف تحديد أنسب النظم من التحميل لمحصولي الذرة الشامية والسمسم وذلك حال زراعتهما محملين معاً في تتابعات مختلفة من مواعيد الزراعة وأثر ذلك على إنتاجية محصول الذرة الشامية حيث تم في هذه الدراسة تحميل الهجين الثلاثي من الذرة الشامية صنف 310 مع السمسم صنف جيزة 32 ، وذلك بثلاثة نظم من التحميل كانت [التحميل على نفس الخط & التحميل على خطوط متبادلة (1:1) ، (2:2) وذلك بزراعة كلا المحصولين في تتابعات (توافيق) من ميعادي الزراعة في (20 إبريل &20 مايو) ، إضافة إلى زراعة الذرة الشامية منفرداً في كلا ميعادي الزراعة السابقين وذلك للمقارنة . نفذت هذه الدراسة باستخدام تصميم القطع المنشقة مرة واحدة بأربعة مكررات حيث خصصت القطع الرئيسية لنظم التحميل الثلاث بينما وزعت المعاملات الست من نظم الزراعة عشوائياً على القطع الفرعية .

أظهرت نتائج هذه الدراسة أن نظم التحميل كان لها تأثيراً عالي المعنوية على صفات: متوسط عدد الأوراق الخضراء / نبات (في الموسم الأول) & مساحة ورقة الكوز العلوي (في الموسمين) & ميعاد ظهور الحريرة لنورات 50 % من النباتات & متوسط ارتفاع النباتات و متوسط قطر السيقان (في الموسم الثاني) بينما كان هذا التأثير معنوياً فقط على صفات :- ميعاد ظهور الحريرة لنورات 50 % (في الموسم الأول) & متوسط عدد صفوف الحبوب / كوز & وزن المائة حبة & وزن الحبوب / نبات & محصول الحبوب / هكتار (في الموسم الثاني).

أوضحت نتائج هذه الدراسة أن جميع الصفات التي تم دراستها وهي :- ميعاد ظهور الحريرة لنوارث 50% من النباتات & عدد الأوراق الخضراء / نبات & مساحة ورقة الكوز العلوي & ارتفاع النباتات & ارتفاع الكوز العلوي & قطر الكوز & طول الكوز & عدد صفوف الحبوب / كوز & وزن المائة حبة & وزن الحبوب / نبات & النسبة المئوية للتفريط ومحصول الحبوب / هكتار، قد تأثرت جميعها تأثراً عالي المعنوية بنظم الزراعة التي تم دراستها (في كلا موسمي الدراسة).

لم يكن للتفاعل بين نظم التحميل ونظم الزراعة والتي تم دراستها تأثيراً معنويا وذلك على جميع الصفات التي تم دراستها (في كلا موسمي الدراسة) .

من خلال نتائج هذه الدراسة يمكن التوصية بضرورة تحميل الذرة الشامية والسمسم بزراعتهما معا في نفس الميقات ، وذلك خلال النصف الثاني من شهر مايو محملين معا على نفس الخط (ريشة لكل محصول) ، وذلك تحت ظروف الأراضي الرملية حديثة الاستزراع (منطقة البستان – محافظة البحيرة) ، حيث أن ذلك من شأنه تحسين إنتاجية محصول الذرة الشامية بالإضافة إلى إنتاج ثانوي من بذور السمسم.