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STUDIES ON INTERCROPPING OF GROUNDNUT AND SOME MAIZE HYBRIDS

Hoda Kh. A. El Mekser [1], R. A. Attalla [2] and S. Th. M. Mousa [1]

1. Maize Res Prog, Field Crops Research Institute, Agric. Res. Center, Giza, Egypt.
2. Crop Intensification Res. Dept., Field Crops Research Institute, Agric. Res. Center, Giza, Egypt.

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ABSTRACT: *A field experiment was conducted in sandy soils under sprinkler irrigation at Ismailia Res Stn during 2006 and 2007 growing seasons to study the relative efficiency of eight maize hybrids to intercropping with peanut. Seventeen treatments i.e. sole peanut, eight maize hybrids (SC10, SC122, SC123, SC155, TWC311, TWC314, TWC324 and TWC352) were intercropped on peanut rows, and the same eight hybrids were sole planted. The experimental design was randomized complete block (RCBD) with four replications. Intercropping was performed by planting maize on peanut rows at the ratio of 2 rows of maize (on peanut rows): 2 rows of peanut. Plot size was eight rows, 5 m long and 60 cm apart. Plant spacing was 25 and 10 cm between hills for maize and peanut, respectively. An early variety of peanut "Giza 5" was used in this study. The highest plant height of peanut was obtained by intercropping S.C 10, S.C. 155, T.W.C. 314 and T.W.C. 352 with peanut compared to the sole peanut in both seasons. Significant reduction was recorded on number of branches plant^{-1}, number of pods plant^{-1}, weight of pods plant^{-1}, weight of seeds per 100 pods (g), shelling percentage and pods yield (ard fed^{-1}) when peanut was intercropped with maize hybrids in both seasons. Respecting maize plant traits in both growing seasons, SC 155 and TWC 352 were the earliest hybrids while SC10 and TWC324 were the latest ones in flowering date in sole planting and when intercropped with peanut. However, SC 10, TWC 311 and TWC 324 produced the highest grain yield per fad under sole planting and when intercropped with peanut in 2007 season, while SC 10, SC 122, TWC 314 and TWC 324 had the highest grain yield when intercropped with peanut in 2006, while SC 155 and TWC 352 produced the lowest yield in both growing seasons. Data on competition relationships indicated that intercropping SC 155 maize hybrid with peanut at the ratio 2:2 system produced high land equivalent ratio (LER = 1.37) followed by TWC 352 (1.30). The highest value of relative crowding coefficient (K) of maize hybrids and peanut was obtained by TWC 352 (3.79). Aggressivity (Agg) showed that maize hybrids were the dominant component and peanut was the dominated. Economic evaluation of intercropping maize hybrids on peanut using 2 rows of maize:2 rows of peanut gave the highest values of total income (LE 10062.4, 9822.4 and 9805.6, respectively) comparing to pure peanut (LE 9052.0). The highest values of net return due*

to intercropping SC 155, TWC 352 and TWC 324 with peanut were LE 8462.4, 8222.4 and 8205.6 LE, respectively compared to sole peanut (7732.0 L.E). Finally, intercropping the two yellow maize hybrids SC 155 and TWC 352 as well as the white hybrid TWC 324 with peanut under 2:2 ratio gave the highest economic return for the farmers.

Key Words: Maize, hybrid, intercropping, competitive, competitive *relationship.*

INTRODUCTION

Groundnut or peanut (*Arachis hypogaea* L.) is potentially the most valuable source of edible oil for human consumption in the world. It is traditionally intercropped with maize (*Zea mays* L.) by small-scale farmers in many places around the world. The farmer's primary objective is to produce a high yield of maize crop. A secondary objective is to produce a good peanut yield. The yield effectiveness, however, of an intercrop is valued with the concept of Land Equivalent Ratio (LER) which is widely used to obtain evidence as to whether two or more crops should be intercropped rather than planted as sole crops (Mead and Willey, 1980 and Vandermeer, 1989)

In many developing countries, farmers refer importance in intercropping not only to crop yield but also to economic values (Santalla, *et al*, 1994). However, there are different systems of intercropping according to the farmer's requirements. One common situation is when the farmer is concerned about only one of the two crops. The intercrops should be compared to the most valuable of two sole crops (Santalla *et al*, 1994). In Egypt, Metwally (1999), Metwally, *et al* (2003) and Metwally *et al* (2005 a and b) concluded that intercropping is strongly recommended to increase farmer's profitability especially in new reclaimed lands where groundnut or peanut is considered as an important cash crop and can be grown successfully in newly reclaimed sandy soils. In 2007 growing season, groundnut occupied about 160000 faddan, most of this area is in the new reclaimed sandy soil. However, Abd-El-Motaleb and Yousif (1998) reported that combining maize with the erect peanut variety "Giza-5" gave the higher grain yield of peanut as well as high shelling percentage. Gaber (1998) observed that the intercropping pattern of 2 rows of maze : 2 rows of peanut was the best intercropping system because it had the highest values of LER and lowest values of aggressivity. Concerning maize crop, Wahua *et al* (1981) reported that maize is often used as a tall canopy crop mixed with many short plant species, so it would be impossible to include all the commonly intercropped species with various spatial and temporal combinations. Many investigators (Eneji and Oko, 1997; Jana and Saren, 1998; Samira *et al*, 2002 and Metwally *et al*, 2005 a and b) concluded that intercropping maize and groundnut at the ratio of 2:2 gave higher values of LER. The relative net return (RNR) was greater than unity. Vahdettin Cifici *et al* (2006) study the effect of intercropping sowing systems with dry bean and maize on yield and some

yield components. They found that planting 2 lines maize + 2 lines bean significantly affected number of pods per plant, number of seeds per plant, seed yield per plant and other yield components of dry bean as well as maize yield and its components. The highest LER (1.08) was obtained by following this system of intercropping.

The objectives of this investigation were to determine the effects of intercropping peanut with different maize hybrids on grain yield and some yield components as well as to determine land equivalent ratio (LER) of both crops.

MATERIALS AND METHODS

A field trial was conducted under sprinkler irrigation system at Ismailia Res Stn (representing sandy soils) during the two successive growing seasons of 2006 and 2007. Dates of planting were 21st and 28th of May in the two growing seasons, respectively. Mechanical and chemical analyses of the experimental soils are presented in Table 1.

Table (1): Mechanical and chemical analyses of the experimental soils at Ismailia.

Mechanical analysis		Chemical analysis	
Corse sand %	13.2	pH (1-2.5 suspension)	7.9
Fine sand %	51.2	EC (m mohs cm^{-1})	0.132
Silt %	20.0	OM %	0.510
Clay %	14.3	Available N ppm	17.3
Soil texture	Sandy	Available P ppm	2.3
		Available K ppm	80.2

Wheat was the previous winter crop in both growing seasons. Randomized complete block design with four replications was used in this study. Plot size was 8 rows, 5 m in length and 60 cm in width (24 m2). One blank row was left between each two plots. Seventeen treatments were randomly distributed in each replicate. Treatments were sole peanut and eight maize hybrids intercropped with peanut and the same eight maize hybrids were sole planted. Mays hybrids were four single crosses, SC 10, SC 122, SC 123, and SC 155 Y, and four three-way crosses, TWC 311, TWC 314, TWC 324 and TWC 352 Y. Intercropping treatments were performed by planting peanut on all the eight rows of the plot and maize hybrids were planted on peanut rows in a ratio of 2 rows of maize (on peanut rows): 2 rows of pure peanut.

Solid peanut was planted in rows, 60 cm apart and 5 cm between hills. Planting was done on both sides of each ridge and an early variety of peanut "Giza-5" was used. Solid maize was planted on ridge, 60 cm between ridges and 25 cm between hills.

Organic manure (20 m3 fed-1) was added before plowing and peanut seeds were inoculated with bacterial root knot (Rizobium legume insorum). Nitrogen fertilizer was side dressed at the rate of 30 and 120 kg N fed-1, for peanut and maize, respectively, in eight equal doses. The first dose was applied one week after planting and the rest was added weekly as side dressing behind each hill. Calcium super phosphate (15.5 P2O5) and potassium sulphate (48% K2O) were added before planting at the rate of 30 kg P2O5 and 48 kg K2O fad-1, respectively.

Sprinkler irrigation was applied every two days intervals. Both crops were harvested on the 23rd and the 30th of September, 2005 and 2006 growing seasons, respectively. At harvest, four rows of maize and peanut were harvested and maize grain yield was adjusted to 15.5% moisture.

Data recorded:

A. Peanut:

1. Plant height (cm) was measured from the soil surface up to the plant top.
2. Number of branches plant^{-1} (average of 10 guarded plants).
3. Number of pods plant^{-1} (average of 10 guarded plants).
4. Weight of pods plant^{-1} (g) (average of 10 guarded plants).
5. Weight of seeds 100 pods^{-1} (g)
6. Shelling % (weight of seeds/weight of pods) x 100
7. Pod yield (ard fed^{-1}).

B. Maize:

1. Number of days from planting to 50% tasseling and silking.
2. Plant height (cm). It was measured from the ground surface to the top of the tassel.
3. Ear position %
4. Ear length and diameter (cm)
5. Cob diameter (cm)
6. Number of rows/ear.
7. Number of kernels/row
8. Grain yield (ard fed^{-1})

C. Competitive relationship and yield advantages:

1. Land equivalent ratio (LER) as described by Willy (1979) as follows:

LER = ((Ypm/Ypp)+(Ymp/Ymm)).

2. Relative crowding coefficient (K) as mentioned by De-Wit (1960) as follows:

K1 = ((Ypm*%Z2)/(Ypp-Ypm)*%Z1

K2 = ((Ypm*%Z1)/(Ymm-Ypm)*%Z2

3. Aggressivety (McGilichrist, 1960)

Agg = A1-A2 for peanut

Agg = ((Ypm/Ymm*%Z1) – (Ymp/Ymm*%Z2)

Agg = A2 –A1 for maize

Agg = ((Ymp/Ymm*%Z2) – (Ymp/Ymm*%Z1)

Where:

Ypp = yield of pure stand peanut

Ymm = yield of pure stand maize

Ypm = yield of peanut intercropped with maize

Ymp = yield of maize intercropped with peanut

%Z1 = area occupied by peanut

%Z2 = area occupied by maize

4. Total income and net return per faddan

Total income was calculated according to the local market price of maize and peanut in 2007.

Analysis of variance was done according to Steel and Torri (1980).

RESULTS AND DISCUSSION

1. Effect of maize hybrids on peanut:

Data presented in Table (2) revealed that intercropping of maize hybrids on peanut rows had a significant effect on different peanut characteristics in both growing seasons. The highest plant heights of peanut were associated with intercropping of SC 10, SC 155, TWC 314 and TWC 352 with peanut. Number of branches plant^{-1} significantly decreased by intercropping different maize hybrids in both growing seasons. The highest reduction was evident to intercropping of peanut with SC 122, in both growing seasons). The same trend was observed respecting other peanut plant characteristics, intercropping of different maize hybrids was linked to a significant decrease in number of pods plant $^{-1}$, pods weight plant^{-1}, seeds weight (100 pods^{-1}) and shelling% as compared with sole peanut.

Table (2): Effect of intercropping of different maize hybrids with peanut on peanut plant characteristics in 2006 and 2007 growing seasons.

Treatments	Plant height cm		Branches plant^{-1}		Pods plant^{-1}		Pod Wt plant^{-1} g		Seeds Wt 100 pods^{-1} g		Shelling %		Pod yield ard fed^{-1}	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Pure peanut	64.2	61.5	12.0	11.1	22.2	24.6	40.4	64.3	29.9	26.8	70.7	78.0	22.1	22.6
Peanut+SC10	72.0	66.9	7.2	8.7	14.7	20.1	26.6	34.7	18.5	18.9	65.2	70.3	12.3	14.5
Peanut+SC122	62.2	64.9	6.8	8.4	13.8	19.6	24.4	35.2	17.4	18.6	62.7	67.0	11.4	13.9
Peanut+SC123	66.3	64.0	7.0	8.5	13.5	19.3	24.0	32.0	18.0	18.7	62.9	66.3	11.4	13.7
Peanut+SC155	72.3	66.5	7.8	9.3	15.5	21.2	27.2	39.6	18.9	20.6	66.3	69.0	14.0	17.6
Peanut+TWC311	62.9	62.9	6.9	8.7	13.5	19.2	23.7	31.4	17.5	17.7	63.2	69.0	11.5	13.0
Peanut+TWC314	71.2	65.7	7.0	8.5	14.5	18.7	23.6	31.5	17.7	18.1	63.0	65.7	11.7	12.8
Peanut+TWC324	63.7	63.3	6.9	8.6	13.3	19.7	24.2	31.3	17.5	18.3	62.7	67.3	12.1	12.8
Peanut+TWC352	71.9	66.7	8.5	9.9	16.8	21.1	28.5	39.4	21.1	20.1	68.9	69.3	14.2	17.5
$LSD_{0.05}$	4.7	3.1	1.2	0.8	1.9	1.2	3.7	4.6	1.8	1.1	4.9	5.1	1.2	2.6
C.V %	4.8	2.7	10.9	5.0	8.6	3.4	9.5	7.0	6.3	3.3	5.2	4.2	5.9	9.7

Comparing to sole peanut, intercropping of maize hybrids with peanut significantly decreased pod yield in ard fad^{-1}. The highest pod yield was obtained by intercropping peanut with SC 10, SC 155, TWC 324 and 352 in both growing seasons. This was true since these hybrids have vigorous plant growth and can compete well when intercropped with peanut plants. In this respect, Asmat Ullah *et al* (2007) in Pakistan recorded maximum seed yield of mungbean and soybean when maize intercropped on it at the rate of 2 rows of maize : 2 rows of mungbean and soybean.

The increase in plant height of peanut plants as a result of intercropping with maize hybrids might be due to the shading effect of maize on peanut plants, which resulted in marked elongation of the internodes of peanut plants searching for more light energy among maize plants (Asmat Ullah *et al*, 2007). The reduction on the other plant characteristics of peanut as a result of intercropping with maize might be due to the competition between peanut and maize plants for light capturing, nutrients and other environmental factors. These results are in agreement with those obtained by Abd El-Motaleb and Yousef (1998), Nofal and Attalla (2006) and Asmat Ullah *et al* (2007). Moreover, Nofal and Attalla (2006) revealed that the intercropping pattern of 2 maize rows:2 peanut rows (60 cm between rows and 25 and 5 cm between maize and peanut plants, respectively) has superior effects on maize yield and other plant characteristics since it permitted better utilization of light intercepted as well as other soil and environmental effects.

2. Effect of peanut on maize hybrids:

Effect of maize-peanut intercropping on the performance of different maize hybrids compared with solid maize in 2006 and 2007 growing seasons is presented in Table 3. Intercropping of SC 10 with peanut at the rate of 2 maize rows:2 peanut rows significantly decreased number of days to 50% silking in 2006 growing season

The yellow maize hybrids SC 155 and TWC 352 were the earliest, while the white SC 10 and TWC 324 were the latest in terms of number of days from planting to 50% tasseling and silking in both seasons.

Plant height of maize hybrids was significantly affected by intercropping with peanut in 2006 and 2007 growing seasons. In general, intercropping of maize hybrids with peanut reduced the plant height of all maize hybrids. The two maize hybrids, SC 10 and TWC 324 were significantly the tallest plants under intercropping conditions in both growing seasons.

No significant differences were detected among sole maize hybrids regarding ear position. But intercropping of maize hybrids with peanut reduced ear position of SC 123 and TWC 311 in 2006 and 2007 seasons.

Regarding ear length, intercropping of different maize hybrids with peanut had a significant effect on ear length in both seasons. Maize hybrids TWC 314 and TWC 324 as well as SC 10 produced the longest ears when intercropped with peanut in both growing season. On the other hand, SC 155 had the shortest ears in both growing seasons.

Table (3): Effect of intercropping different maize hybrid with peanut on maize plant characteristics in 2006 and 2007 growing seasons.

Maize hybrids	Days to 50 % Tasseling		Days to 50 % silking		Plant height cm		Ear position %		Ear length cm	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Sole crop										
SC10	63.3	61.8	64.0	63.5	339	318	51.8	56.4	22.2	21.3
SC122	61.8	61.5	62.5	63.5	310	285	52.8	55.2	21.2	20.4
SC123	62.0	61.0	62.8	63.5	308	288	50.0	49.7	19.2	18.6
SC155	59.0	57.5	59.3	59.3	303	287	51.1	53.5	17.7	16.8
TWC311	62.0	60.3	62.8	62.8	312	307	48.8	52.6	21.1	20.9
TWC314	61.5	60.8	62.3	63.3	316	314	50.5	54.6	23.9	22.0
TWC324	62.3	60.8	62.8	62.3	318	318	52.7	52.5	22.7	22.1
TWC352	59.5	58.3	60.5	61.0	298	280	50.4	51.8	18.3	17.6
Intercropping										
SC10	62.8	61.8	63.0	63.3	322	303	47.6	52.0	23.0	21.2
SC122	61.0	61.3	62.3	63.3	295	266	51.0	54.2	21.7	20.6
SC123	62.5	61.8	63.8	63.3	293	274	44.3	48.9	20.0	18.9
SC155	59.5	58.3	59.8	60.8	283	283	46.8	50.4	18.8	16.7
TWC311	62.3	60.0	63.0	62.0	309	293	44.1	46.9	22.9	20.2
TWC314	61.5	60.5	62.8	63.3	314	289	50.0	53.3	24.2	22.5
TWC324	63.0	61.0	63.8	63.3	322	310	48.5	52.2	23.2	22.4
TWC352	59.5	58.5	60.8	61.3	286	273	48.2	53.2	19.1	18.2
$LSD_{0.05}$	0.9	1.3	1.0	1.5	17	30	4.6	3.7	1.4	1.1
C.V %	1.0	1.5	1.1	1.7	3.8	7.3	6.6	4.9	4.5	3.8

Data presented in Table 4 revealed that the eight hybrids differed significantly in ear diameter in both seasons. Three-way cross 352 had the highest number of rows ear^{-1} followed by TWC 311, when intercropped with peanut in both growing seasons. Number of kernels row^{-1} ranged from 37.2 for SC 155 to 49.0 for SC 10 in the first season and from 36.8 for SC 155 to 48.8 for TWC 324 in the second season, when maize was intercropped with peanut. While, number of kernels row^{-1} ranged from 36.4 for SC 155 to 48.7 for SC 10 in the first season and from 36.6 for TWC 352 to 48.7 for TWC 324, in the second season when the maize was solid.

The white maize hybrids SC 10, TWC 324 and TWC 311 produced the highest grain yield under sole planting, While SC 10, SC 122, TWC 314, and TWC 324 had the highest grain yield when intercropped with peanut in 2006. In 2007 SC 10, TWC 311, and TWC 324 produced the highest grain yield when planted either as sole or intercropped with peanut(Table 4). Results clearly indicated that the most suitable maize hybrids for intercropping that had shorter plants and flowered early (SC 122 and SC 155 Y). Also, differences in growth, grain yield, and its components among maize hybrids under this study might be due to the differences in their genetic makeup, which affected

their response to intercropping treatments and other environmental factors that affected the biological activities and consequently the total biomass. Results are in agreement with those reported by Gouda *et al* (1992), Attalla (1996), Nofal and Mobarak (2003), Nofal *et al* (2005), and Nofal and Attalla (2006) who recorded significant differences among different maize hybrids in grain yield and other plant characteristics.

Table (4): Effect of intercropping different maize hybrid with peanut on ear diameter, rows ear^{-1}, kernels row^{-1} and grain yield in 2006 and 2007 growing seasons.

Hybrids	Ear diameter cm		rows ear^{-1}		Kernels row^{-1}		Grain yield ard fed^{-1}	
	2006	2007	2006	2007	2006	2007	2006	2007
SC10	5.2	4.9	13.4	13.2	48.7	48.2	29.18	40.28
SC122	5.1	4.7	13.9	14.1	46.9	46.9	26.79	35.21
SC123	5.5	4.9	14.2	13.6	43.0	43.6	27.39	34.31
SC155	5.2	4.8	15.0	14.4	36.4	37.0	25.73	30.24
TWC311	5.3	5.1	15.5	15.2	44.5	46.0	28.99	39.03
TWC314	5.3	4.8	14.3	13.8	47.3	48.5	27.83	34.73
TWC324	5.3	4.8	14.1	13.8	47.7	48.7	29.46	40.35
TWC352	5.3	4.7	15.7	15.2	38.5	36.6	23.69	31.46
Peanut +								
SC10	5.2	4.8	13.0	13.2	49.0	47.8	18.64	21.20
SC122	5.3	4.7	13.7	13.1	48.8	47.3	17.46	18.52
SC123	5.4	5.0	14.4	13.4	44.7	44.8	15.52	17.07
SC155	5.3	4.8	14.7	14.5	37.2	36.8	13.17	17.31
TWC311	5.4	5.0	14.9	15.1	47.3	46.0	16.42	20.73
TWC314	5.4	4.9	14.1	14.0	47.4	47.6	17.19	18.35
TWC324	5.4	4.9	13.7	12.8	47.6	48.8	18.43	22.98
TWC352	5.4	5.0	16.5	15.5	39.8	40.3	14.15	16.00
$LSD_{0.05}$	0.2	0.2	1.1	0.9	2.2	2.7	2.1	2.1
C.V %	2.2	3.0	5.4	4.6	4.6	4.2	6.7	5.4

3- Competitive relationship:

A-Land equivalent ratio (LER):

Data in Table 5 indicated clearly that land equivalent ratio was influenced by planting maize hybrids with peanut under intercropping system (2:2 ratio, 25 cm between hills and one plant hill^{-1}). Growing maize hybrids SC 155 followed by TWC 352 intercropped with peanut produced maximum LER.

Data of land equivalent ratio (LER), revealed that sum of both RYP and RYM gave yield advantages. Yield advantage of the yellow maize hybrids SC 155 and TWC 352 intercropped with peanut may be attributed to the shorter yellow maize hybrids that had less vegetative growth than the white hybrids. Consequently, the competition of yellow hybrids to peanut is less than the

white hybrids. Similar results were recorded by Eneji and Oko, 1997; Jana and Saren 1998, Samira et al 2002, Metwally *et al* 2005 a, b and Nofal and Attalla (2006).

Table (5): Competitive relationships of peanut as affected by some maize hybrids and intercropping system in 2006 and 2007 seasons.

	LER			K			Agg	
	Lp	Lm	LER	Kp	Km	K	Peanut	Maize
Peanut +								
SC10	0.52	0.57	1.09	0.65	2.15	1.40	-0.47	+0.47
SC122	0.61	0.51	1.12	0.80	3.64	2.91	-0.42	+0.42
SC123	0.61	0.50	1.11	0.77	1.97	1.51	-0.38	+0.38
SC155	0.78	0.59	1.37	1.75	1.44	2.52	-0.40	+0.40
TWC311	0.57	0.51	1.08	0.67	2.12	1.42	-0.46	+0.46
TWC314	0.57	0.53	1.10	0.65	2.28	1.48	-0.50	+0.50
TWC324	0.64	0.58	1.22	0.89	2.80	2.49	-0.53	+0.53
TWC352	0.77	0.53	1.30	1.71	2.22	3.79	-0.28	+0.28

Table (6): Total income and net return of peanut as affected by some maize hybrids and intercropping system in 2006 and 2007 seasons

	Yield ard fed^{-1}				Total income(LE)			Net return		
	Peanut		Maize							
	Sole	Inter	Sole	Inter	Sole peanut	Sole maize	Inter-crop	Sole peanut	Sole maize	Inter-crop
Peanut	22.63				9052.0			7732.0		
SC10		12.80	44.38	22.99	459.8	7100.8	8798.4		5380.8	7198.4
SC122		13.90	39.42	20.28	405.6	6307.2	8804.8		4587.2	7204.8
SC123		13.73	37.91	18.78	375.6	6065.6	8496.8		4345.6	6896.8
SC155		17.60	32.02	18.89	377.8	5123.2	10062.4		3403.2	8462.4
TWC311		12.37	43.20	22.24	444.8	6912.0	8746.4		5192.0	7146.4
TWC314		12.80	38.70	20.63	412.6	6192.0	8420.8		4472.0	6820.8
TWC324		14.47	43.02	25.11	502.2	6883.2	9805.6		5163.2	8205.6
TWC352		17.50	33.56	17.64	352.8	5369.6	9822.4		3649.6	8222.4

The price was calculated as market price, Peanut = LE 400 ardab^{-1}, Maize = LE 160 ardab^{-1}.

B-Relative crowding coefficient (RCC):

Data of the relative crowding coefficient (Table 5) indicated that maize hybrid TWC 352 under intercropping system (2:2 ratio, 25 cm between hills and one plant hill^{-1}) gave the highest value (3.79) compared with the other maize hybrids, while, minimum value was obtained by SC10 maize hybrid (1.40). It could be concluded that the highest value of RCC by TWC 352 was due mainly to the less competition of the yellow maize hybrids to peanut than the white hybrid SC10. Similar results were obtained by Hussein *et al* 2002 and Nofal and Attalla (2006).

C-Aggressivity (Agg):

Results in Table 5 revealed that maize hybrid TWC 352 had the lowest value of aggressivity (0.28) when intercropped on peanut (2:2 ratio, 25 cm between hills and one plant hill^{-1}). Maize hybrids were the dominant and peanut was dominated. Similar results were obtained by Gabr (1999) and Nofal and Attalla (2006).

D- Economic Evaluation:

Results in Table 6 indicated that The evaluation of intercropping maize hybrids with peanut using 2:2 ratio in Table 5 indicated that SC 10 followed by TWC 352 and TWC 324 gave the highest values of total income compared to solid peanut and maize hybrids. The lowest values of total income were recorded by growing TWC314 with peanut. The highest values of net income (LE 8462.4, 8222.4 and 8205.6) were obtained by intercropping SC 155, TWC 352, and TWC 324, respectively with peanut. On the other hand, the lowest value of net return was obtained by TWC 314 (LE 6820.8). Intercropping treatment gave higher values of relative net return greater than unity. These results are in agreement with those of Jana and Saren (1998), Samira *et al* (2002) and Metwally *et al* (2005 a,b).

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تحميل بعض هجن الذرة الشامية مع الفول السودانى

هدى خيرى عبد المنعم المقصر[1]- رجب أحمد عطاالله[2]-
سمير ثروت محمود موسى[1]

١.قسم بحوث الذرة الشامية - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية - الجيزة
٢.قسم بحوث التكثيف المحصولى - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية - الجيزة

الملخص العربي

أقيمت تجربة حقلية بمحطة بحوث اللإسماعيلية - مركز البحوث الزراعية فى الأراضى الرملية تحت نظام الرى بالرش خلال موسمى ٢٠٠٦ ، ٢٠٠٧ لدراسة كفاءة بعض هجن الذرة الشامية (هـ. ف ١٠ ، هـ. ف ١٢٢، هـ. ف ١٢٣، هـ. ف ١٥٥، هـ. ث ٣١١، هـ.ث ٣١٤، هـ.ث ٣٢٤، هـ.ث ٣٥٢ تحت نظام تحميل (ذرة شامية منفرد ، فول سودانى منفرد ، نظام تحميل ٢:٢) حيث تم زراعة كل القطع التجريبية بالفول السودانى ثم زراعة هجن الذرة على خطين من الفول السودانى وترك خطين فول سودانى بدون زراعة ذرة عليها . وكانت المسافة بين نباتات الذرة ٢٥ سم وخفت النباتات على نبات واحد فى الجورة.كما تمت زراعة الصنف جيزة-٥ من الفول السودانى وكانت مسافة الزراعة بين الجور ١٠ سم وكان تصميم التجربة قطع كاملة العشوائية فى أربع مكررات . وقد تم الحصول على أعلى أرتفاع لنبات الفول السودانى عند تحميلة مع هـ.ف ١٠، هـ.ف ١٥٥، هـ.ث ٣١٤ ، هـ.ث ٣٥٢، مقارنه بغير المحمل (المزروع منفرد) فى كلا الموسمين. وقد كانت جميع صفات الفول السودانى مثل عدد الأفرع/نبات ، عدد القرون/نبات ، وزن القرون/ نبات (جم) ، وزن الحبوب/١٠٠ قرن (جم) ، النسبه المئويه لتصافى التفريط ، كذلك محصول القرون بالأردب فدان معنوية عندما حمل الفول السودانى على هجن الذرة الشامية فى كلا الموسمين. كما سجلت أعلى قيم لهذه الصفات عندما زرع الفول السودانى منفردا مقارنه بزراعتة محملا. وبالنسبة لهجن الذرة الشامية ، فقد تفوق كلا من هـ.ف ١٥٥ ، هـ.ث ٣٥٢ فى صفه التبكير فى التزهير مقارنة بباقى الهجن عند التحميل مع الفول السودانى بينما سجل هـ.ف

١٠ ، هـ.ث ٣٢٤ تأخير فى التزهير ،بينما سجل هـ.ف ١٠ أعلى أرتفاع للنبات وموقع الكوز وهو منزرع منفردا وكذلك الهجينين ١٥٥, ٣٥٢ المحملين مع الفول السودانى فى كلا الموسمين. ومن ناحية أخرى فقد أعطى كلا من هـ.ف ١٠ ،هـ.ث ٣١١، هـ.ث ٣٢٤ أعلى محصول حبوب للفدان ، بينما أعطى هـ.ف ١٥٥ ، هـ.ث ٣٥٢ أقل محصول حبوب للفدان فى كلا الموسمين. سجلت العلاقات التنافسية زيادة فى معدل إستغلال الأرض وقد تفوق الهجين الفردى الأصفر ١٥٥ يلية الهجين الثلاثى ٣٥٢ عند تحميلة مع الفول السودانى تحت نظام ٢:٢ . كما سجل معدل الحشد النسبى بين النباتات ميزة تنافسية بزيادة قيمته عن الواحد الصحيح وكانت الذرة هى المحصول السائد بينما الفول السودانى هو المحصول المسود. وبالنسبة للتقييم الإقتصادى فقد دلت النتائج أن تحميل هـ.ف١٥٥ يلية هـ.ث ٣٥٢ ثم هـ.ث ٣٢٤ مع الفول السودانى تحت نظام ٢:٢ قد أعطى أعلى عائد نقدى مقارنة بمحصول الفول منفرد. وأعلى صافى ربح أمكن الحصول علية بنفس الهجن السابقة عند تحميلها مع الفول السودانى تحت نفس النظام (٨٤٦٢,٤, ٨٢٢٢,٤ , ٨٢٠٥,٦ جنيه مصرى) على التوالى مقارنه بالفول المنفرد الذى كان صافى العائد له ٧٧٣٢ جنيه مصرى. وتبين هذه الدراسة أن الهجين الفردى الأصفر ١٥٥ والثلاثى الأصفر ٣٥٢ هما أنسب الهجن للتحميل مع صنف الفول السودانى جيزة ٥ تحت نظام التحميل ٢:٢ للحصول على أعلى عائد إقتصادى للمزارع.