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PERFORMANCE OF SOME MAIZE CULTIVARS UNDER DIFFERENT INTERCROPPING PATTARNS WITH PEANUT

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ABSTRACT: *A field experiment was carried out at Agricultural Research Station in Ismailia Governorate during 2011 and 2012 seasons to study the effect of some intercropping patterns (100 % peanut + 50 % maize), (100 % peanut + 33 % maize), (100 % peanut + 25 % maize), (100 % peanut + 16.7 % maize) and three maize hybrids (SC 122, SC 128 and TWC 310) on growth, yield and yield components of maize and peanut. A split-plots design with three replications was used. The main plots were devoted to the previous three maize hybrids, whereas, the sub-plots were allocated to the intercropping patterns of maize hybrids with peanut. Land equivalent ratio (LER) was proved land usage in all treatments in both seasons. Aggressively indicated the maize was the dominant, and peanut was the dominated. The increasing in total income between (11176.3 - 13250.7 L.E) as compared with main crop (peanut) in both seasons.*

The main obvious results of this study can be summarized as follows.

Maize:

The results revealed that SC 128 maize hybrid gave the highest values for yield and yield components characters, whereas TWC 310 cultivar gave the lowest values in combined data. When maize plant density with peanut was increased from 16.7 % to 25 % to 33 % up to 50 %, yield components of maize recorded gradual reduction, whereas maize grain yield had the opposite trend.

Interaction effect of plant height, weight of gains/ear, weight of ear and 100-grains and grain yield/fed were significantly affected by maize hybrids and intercropping patterns.

Peanut:

Results indicated that all studied characters except shelling % were reduced significantly, by intercropping with maize in combined data.

Intercropping pattern (100 % peanut + 16.7 % maize gave the highest values for all yield and yield components of peanut ,whereas (100% peanut + 50 % maize) was the lowest in combined data .Weight of seeds and pods/plant ,weight of 100-seed and pods yield/fed were significantly affected by the interaction between both factors.

Competitive relationship:

The results revealed that intercropping (100% peanut+ 50 % maize SC 128) recorded the highest values of Land Equivalent Ratio LER (1.48). Aggressively showed high positive values for maize exceeded the unit and maize was the dominant component whereas, peanut was the dominated in all intercropping treatments.

The highest values of total income (L.E. /fed.) could be achieved by SC 128 using the intercropping system of 100 % peanut + 33 % maize, (13250.7 L.E).

Key words: *Maize, Peanut , Intercropping, Cultivars, Yield .*

INTRODUCTION

Intercropping system is one of the most important practices as a way to increase the productivity per unit areas. This may be due to some speculated advantages for intercropping systems such as higher yields, greater land-use efficiency and improvement of soil fertility through the addition of N by fixation and excretion from the component legume. Peanut (*Arachis hypogaea* L.) is an important summer oil crop meanwhile, maize (*Zea mays* L.) is the second summer cereal crop in Egypt, considering acreage

and total production. Peanut is commonly intercropped with cereal crops such as, millet, maize and sorghum (Reddy *et al.* 1986). Maize/peanut intercropping helps to increase production through the efficient utilization of solar energy (Awal *et al.* 2006). Intercropping sorghum with peanut might increase, decrease or had no effect on yield of sorghum or peanut, depending on the spatial arrangements of intercropping. However, growing sorghum and peanut in intercrop enhances land use efficiency and increases monetary returns (Langat *et al.* 2006). Under saline condition Shalim Uddin *et al.* (2003), reported that, yield of peanut was reduced in intercropping pattern compared to sole peanut similar trend for maize crop was observed. Intercropping peanut with maize in 4:2 row proportions was most remunerative in respect to net return, high competitive ratios, land-equivalent ratio and monetary advantage among all intercropping systems (Dutta and Bandyopadhyay, 2006). Higher values of land-equivalent ratio were obtained by maize + peanut in 2:2 row ratios than that of 1:1 row ratio. Nodulation of peanut, crude protein and ear yield of maize were maximum in mixed crops at the 1:4 ratio. In contrast, intercropping maize and peanut reduced dry matter and grain yields of both crops. The only exception was observed on nodule number and seed/pod and yield ratio of peanut, plant height, dry matter and grain yield of maize, where no differences were noted between mono cropped and intercropped system (Mandimba *et al.* 1993). Peanut/maize intercropping under different alternating ratios was studied and results indicated that, pure stand of both crops gave the highest yields. Intercropping at 4:1 rows ratio had an advantage over the other ratios (Freire and Reddy 1989 as well as Jana and Saren 1998 and Abd El-Zaher *et al.* 2007). There are many patterns of intercropping peanut with maize such as, mixed intercropping and alternating ridges under different ratios. Yield of individual plants for both crops were higher under low density but the *vice versa* was true with yields per Fadden (Abd El-Motaleb and Yousef 1998, Hussein, *et al* 2002, Metwally *et al* 2005 and Sherif *et al* 2005). Nofal and Attalla (2006) reported that, under different intercropping systems of some maize hybrids with peanut. There was a significant difference among the efficiency of hybrid maize for growth, yield and yield components of both crops. The aims of this investigation were to evaluate the performance of three maize hybrids under different intercropping systems with peanut to determine the most efficient maize hybrid for intercropping and the best intercropping system.

MATERIALS AND METHODS

A field experiments were carried out at Ismailia Agric. Res. station, Egypt in 2011 and 2012 seasons, to study the effect of three maize hybrids (SC 122, SC 128 and TWC 310) and four intercropping systems, beside four solid stands (three maize hybrids and peanut pure stand) on growth, yield and yield components of maize and peanut. A split-plots design with three replications was used. The main plots were devoted to the three maize hybrids, whereas, the sub-plots were the intercropping patterns of maize varieties with peanut. The size of sub-plots was 21.6 m^2 (3.0 m long, containing 12 ridges at ridge spacing of 60 cm apart).

Intercropping patterns were:-

P_1- 100% peanut+50% maize (planting maize to the other side of the second peanut ridge at 35 cm apart and thinned to one plant/hill)

P_2- 100% peanut+33% maize (planting maize to the other side of the third peanut ridge at 35 cm apart and thinned to one plant/hill

P_3- 100% peanut+25 % maize (planting maize to the other side of the fourth peanut ridge at 35 cm apart and thinned to one plant/hill

P_4- 100% peanut+16.7 % maize (planting maize to the other side of the fifth peanut ridge at 35 cm apart and thinned to one plant/hill

In all intercropping systems or solid planting, peanut was sown on one side at 10 cm apart and thinned to two plants /hill. Solid

maize was grown in ridges at 60 cm apart, in hills spaced 35cm, one plant per hill giving 20000 plants/fed, while pure peanut was grown one side of the ridge at 10cm apart with one plant /hill (70000 plants/fed).

Peanut variety Giza 6 was sown on May 3th and May 7th in the first and second the seasons respectively. While maize was sown on May 27th and May 30th in the first season and second season, respectively. During land preparation, 25 kg P_2O_5/fed in the form of calcium super phosphate (15% P_2O_5) were added. Nitrogen fertilizer was used at the rate of 25 kg N/fed for peanut and 120 kg N/fed for Maize according to plant density per unit area in the forum of ammonium sulfate (20.5% N) in two equal doses. The first dose was after thinning and the second was after a month. Potassium fertilizer was added at the rate of 100 Kg K_2O/fed for peanut and 25 K g (K_2O/fed) for maize in the form of potassium sulfate (48% K_2O). Normal cultural practices for growing both crops were followed as recommended. Harvesting took place on Sep. 21rd and Sep23th for peanut in both seasons. Harvesting took place on Sep., 7th and 10th for maize, in the first and the second seasons, respectively.

At harvesting, 10 guarded plants were taken at random from each treatment in each replicate to estimate growth characters and yield components. Meanwhile pod yield of peanut and grain yield of maize were estimated on plot basis, where, transformed thereafter to Ardab/fed. Dried mature seeds of peanut were ground to very fine powder to estimate oil percentage using the modified Soxohelt apparatus with pure petroleum ether as solvent according to A.O.A.C. (1984).

The soil texture was sandy. Table (1) showed the soil properties in the two growing seasons. The preceding winter crop was faba bean (*Vicia faba* L.) in both seasons.

Table (1): Physical and chemical analysis of the experimental sites during 2011 and 2102 seasons.

Soil properties	2011	2012
Mechanical analysis		
Coarse sand %	26.50	27.10
Fine sand %	65.84	65.45
Silt %	3.86	3.93
Clay %	1.44	1.70
Soil texture	Sandy	Sandy
Chemical analysis		
PH	7.73	7.77
$CaCO^3$	1.35%	1.50%
N	19.50	18.70
P	2.62	2.47
K	38.80	39.33

Available N, P and K were determined according to Black (1965).
In general, soil content of N, P and K was low.

Studied characters:

1-Peanut:-

Plant height (cm), numbers of branches/plant,number of pods/plant, weight of seeds/plant, (g) weight of pods/plant (g),100-seed weight (g),shelling %, seed oil % and pod yield (ard/fed) were from all whole and calculated to feddan and seed oil %.

Shelling percentage = Weight of seeds/plant (g) / Weight of pods/plant (g) X 100

2-Maize:-

Plant height(cm), ear length(cm),ear diameter(cm),number of grains/ear(g), weight of grains/ear(g),weight of ear(g),weight of 100-grain(g),shelling % and grain yield (ard/fed). (ardab equal to 140 kg of shelled grain adjusted to 15.5 % moisture content).

3-Competitve relationship:-

1- Land equivalent ratio (LER)

LER is determined as the sum of the fractions of the yield of the intercrops relative to their sole crop yields (Willey and Osiru 1972). Land Equivalent Ratio (LER) was determined according to the following formula:

$$LER = \frac{Ypm}{Ypp} + \frac{Ymp}{Ymm}$$

Where

Ypp = Pure stand yield of peanut.

Ymm = Pure stand yield of maize.

Ymp = Mixture yield of p when combined with m.

Ysf = Mixture yield of m when combined with p.

2- Aggressivity (A)

This parameter was proposed by Mc-Gilichrist (1965). It gives a simple measure of how much the relative yield increase in species (s) is greater than that of species (f). Aggressivety "A" is determined according to the following formula:

$$Asf = \frac{Y\,fs}{Y\,ss \times Zsf} - \frac{Y\,sf}{Y\,ff \times Zfs}$$

Where:

Asf = Aggressivety value for the components "s"

Ysf = mixture yield of (s) (when combined with f)

Yss = pure stand yield of crop "s"

Zsf = planted proportion of species (s) (in a mixture with f)

Yff = pure stand yield of crop "f"

Zfs= planted proportion of species (f) (in a mixture with s)

Yfs = mixture yield of (f) (when combined with s)

An aggressively value of zero indicates that the component species are equally competitive. For any other situation, both species will have the same numerical value but the sign of the dominant species will be positive and the dominated negative. The greater the numerical value the bigger the difference in competitive abilities and the bigger the difference between actual and "expected" yield.

3- Relative Crowding Coefficient (RCC)

RCC was proposed according to Hall (1974).It assumes that mixture treatment forms a replacement series. Each series has its own coefficient (K) which gives a measure to indicate that series has produced more, less or equal yield to that expected. Relative crowding coefficient (RCC) was determined according to the following formula: for species (a) in a mixture with species (b).

$$Kab = \frac{Y\,ab \times Zba}{(Yaa - Y\,ab) \times Zab}$$

Where

Zab = Sown proportion of species a (in a mixture with b).

Zba = Sown proportion of species b (in a mixture with a).

$$Kba = \frac{Y\,ba \times Zab}{(Ybb - Y\,ba) \times Zba}$$

If a species has a coefficient less than, equal to, or greater than 1, it means it has produced less yield, the same yield, or more yield than the expected, respectively.

The component crop with the higher coefficient is the dominant one. To determine if there is a yield advantage of

mixing, the product of the coefficient is formed by multiplying Kab x Kba.

4-Economic evaluation:

The Total income fed^{-1} was calculated for each treatment in Egyptian pounds, using the market prices for both years. The market prices for peanut was 557.00 L.E $ardab^{-1}$ in the two successive seasons and 303.00 L.E $ardab^{-1}$ for grain of maize (Agriculture Statistics 2010 / 2011). Moreover, profitability was calculated for each treatment according to the following formula: Profitability = (Net benefit / total variable cost) x 100.

Statistical analysis

The collected data were statistically analyzed according to Sendecor and Cochran (1980) and treatment means were compared by the least significant differences (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

A:-Maize

1- Effect of maize cultivars

Date in Table (2) showed that maize hybrids (SC 122, SC 128 and TWC 310) had a significant affect for all studied characters from combined data. TWC 310 cultivar recorded the tallest plants followed by Giza122 then Giza 128. The differences among hybrids may be due to the difference of genetic constitution of hybrids. This result is in agreement with those reported by Abd El- Motaleb and Yousef (1998). SC 128 cultivar gave the highest values of all yield components characters i.e. ear length, ear diameter, number of grains/ear, weight of grains/ear weight of ear ,shelling % and weight 100-grains , except for weight of grains/ear and weight of ear which recorded the second significant value in both seasons . Whereas, TWC 310 gave the minimum traits values from the combined data. These finding might be attributed to the differences in the genetic constitution, of the studied maize hybrids.

The results obviously indicated that SC 128 produced the highest grain yield followed by SC 122; TWC 310 gave the least grain yield. The increment in this character for SC 128 was due to its superiority in most yield components. Grain yield of SC 128 surpassed that of the other two hybrids by 5.4% and 10.2% (SC 122 and TWC 310, respectively).

There was no significant difference between SC 122 and TWC 310 in terms of grain yield in combined data. The same was observed in 2011 and 2012 seasons. The differences among maize hybrids in this study may be due to the difference of genetic constitution of cultivars. These results are in agreement with those reported by Abd El-Motaleb and Yousef 1998 as well as Nofal, and Attalla 2006.

Table (2): Effect of maize hybrids on growth, yield and yield components, combined data of bath seasons).

Characters / Varieties	Plant height (cm)	Ear length (cm)	Ear diameter (cm)	No.of grains/ ear (g)	W.of grain/ ear (g)	W.of ear (g)	Shelling %	W. of 100 grain (g)	Grian yield (Ard/fed)
SC 122	219.65	17.00	43.88	38.64	192.15	258.26	75.14	37.86	9.94
TWC310	225.50	16.06	43.30	37.07	180.51	243.80	73.87	37.16	8.65
SC 128	210.84	17.38	44.33	39.32	193.50	256.20	75.82	38.57	10.27
$LSD_{00.5}$	5.20	1.34	0.35	0.28	3.28	3.45	1.33	1.05	0.64
Pure 122	222.50	18.00	45.22	40.30	227.68	296.75	78.00	39.70	22.33
Pure 310	217.45	17.20	44.60	39.16	214.30	282.10	77.15	38.60	21.90
Pure 128	211.80	18.40	45.33	40.98	226.33	288.77	79.00	40.19	22.65

2-Effect of intercropping systems

Data in Table (3) showed that intercropping systems significantly affected all characters of maize. Planting maize on the second groundnut ridges (100 % groundnut + 50 % maize) recorded the highest values for maize plants followed by (100% +33%) followed by (100% +25%) and the lowest values was showed with (100% + 16.7 %) in both seasons and combined data. Increasing of intercropped maize ratio with groundnut gradually increased plant height. This finding might be due to inter-competition between maize plants for light. Yield and yield components of maize were significantly affected by intercropping systems in 2011 and 2012 seasons and combined data. Ear length, ear diameter, number of grains/row, weight of kernels ear, weight of ear, weight of 100-grains and shelling percentage increased with increasing maize/ peanut ratio of intercropping systems. While, the intercropping system 1:4 (which includes 100 % for peanut and 16.7% of maize) recorded the highest values of the previous traits but the *vice versa* was true with plant height.

Concerning grain yield, it was noticed that, general intercropping in deceased gain yield compared to sole cropping. Pure stand of maize had the highest grain yield, since, grain yield was obtained from the whole land area compared with intercropping treatments which were obtained from 50%, 33%, 25%, and 16.7% in 1:1,1:2, 1:3 and 1:4 in intercropping systems, respectively. Intercropping systems 1:1 which including 100% of peanut and 50% of maize gave the highest value of grain yield. Whereas, intercropping systems 1:4 which including 100 % of peanut and 16.7% of maize from pure stand gave the lowest values of grain yield/fed in combined data. The reduction in grain yield/fed under intercropping systems compared to solid culture might be due to the differences of distribuKtion for both crops per unit area under intercropping systems, which result in maximizing the effect of inter and intra-specific competition among maize plants. Also the competition between peanut and maize plants as well. Similar results were obtained by Dutta and Bandyopadhyay 2006, Mandimba *et al.* 1993, Freire and Reddy 1989, Jana and Saren 1998 and Nofal, and Attalla 2006.

Table (3): Effect of intercropping systems on growth, yield and yield components of maize (combined data of both seasons).

Characters / intercropping	Plant height (cm)	Ear length (cm)	Ear diameter (cm)	No.of grains/ ear	W.of grain/ ear (g)	W.of ear (g)	Shelling %	W. of 100 grain(g)	Grian yield (ard/fed)
1:1	228.44	16.06	42.81	37.53	175.88	237.91	73.86	76.91	13.92
1:2	223.13	16.45	43.46	38.07	185.54	249.51	74.88	77.59	10.10
1:3	216.24	16.92	44.11	38.65	191.68	257.23	75.56	78.17	8.28
1:4	206.83	17.81	44.95	39.12	201.79	266.37	75.47	78.18	6.19
$LSD_{0.05}$	5.19	0.67	1.52	1.13	6.87	7.46	NS	1.37	2.11
Pure 122	222.50	18.00	45.22	40.30	227.68	296.75	78.00	39.70	22.33
Pure310	217.45	17.20	44.60	39.16	214.30	282.10	77.15	38.60	21.90
Pure128	211.80	18.40	45.33	40.98	226.33	288.77	79.00	40.19	22.65

3-Itercation effects:-
Maize cultivars× intercropping systems interaction:

Data presented in Table (4) indicated that plant height, weight of grains/ear, weight of ear, weight of 100-grain and grain yield/fed were significantly affected by the interaction between maize cultivars and intercropping systems. The intercropping system of 1:1 (100 % peanut and 50% maize) recorded the highest value for plant height of TWC 310 maize hybrid. On the other side ,the lowest value was showed with SC Giza 128 under 100 % peanut and 16.7 % maize of pure stand) in both seasons, combined data in Table (6). Weight of grains/ear and 100-grain recorded the highest values with SC 128 cultivar under 100 % peanut and 16.7 % maize; and the lowest values were recorded when maize plant by 50 % + 100 % peanut with TWC 310 maize hybrid, combined data.

As for grain yield, results indicated that SC Giza 128 recorded the highest value when maize was planted on the other side of the second peanut ridge; and on the opposite, TWC 310 gave the lowest value when maize was planted on the other side of sixth peanut ridge for grain yield /fed in both seasons, combined data as shown in Table (4) compared with sole peanut in combined data. The maximum reduction was showed with Giza maize cultivar followed by TWC 310; and the minimum values were showed with SC 122 hybrid, this is completely true for plant height, number of branches/plant, number of pods/plant, weight of seeds/plant, weight of Pods/plant, 100-seed weight, pods yield/fed and seed oil percentage, combined data. This finding is coincide with data in Table (6) which recorded the highest value for plant height with SC 122 followed by TWC 310 and the lowest value was showed with SC 128 in combined data. This reduction indicates clearly that the great competition resulting from maize plants through their shading effect, as well as the effect of competition among peanut and maize plants.

Table (4): Effect of the interaction of maize hybrids and intercropping systems on plant height, weight of grains/ear, and weight of ear, weight of 100-grain and grain yield(combined data of bath seasons).

Characters		Plant height (cm)	Weight of grains/ear(g)	Weight of ear (g)	Weight of 100-grain(g)	Grain yield (ard/fed)
Giza 122	1:1	227.16	181.29	245.37	36.91	14.10
	1:2	224.01	192.28	256.57	37.70	10.20
	1:3	218.44	190.24	261.48	38.18	8.83
	1:4	208.96	204.78	269.70	38.60	6.65
TWC 310	1:1	237.27	165.01	227.68	36.29	13.33
	1:2	229.24	177.83	240.4	36.87	9.33
	1:3	221.29	185.69	249.66	37.45	6.91
	1:4	214.17	193.51	257.43	38.00	5.03
Giza 128	1:1	220.88	181.36	240.74	37.68	14.34
	1:2	218.15	186.50	251.51	38.18	10.77
	1:3	208.96	199.09	260.55	38.93	9.08
	1:4	197.35	207.08	271.99	39.46	6.88
$LSD_{0.05}$		7.36	11.35	12.40	1.95	2.58

B: - Peanut

1- Effect of maize cultivars

Results in Table (5) indicated that all peanut characters were significantly affected by intercropping with hybrids maize, except shelling %. Results obviously indicated that values of studied peanut characters were reduced except shelling % which was not significantly influenced by intercropping with maize as shown in Table (5). Result indicated also that shelling % in peanut is greatly influenced by the genetic makeup of the variety. These results are in agreement with those reported by Abd El-Motaleb and Yousef 1998 as well as Nofal and Attalla 2006. On the other hand, shelling percentage was not affected by maize in both seasons and combined data. Pure stand of peanut recorded the highest values for studies traits as compared with intercropping practice. The tallest plants of peanut were obtained under intercropping peanut with maize SC 122 maize in both seasons and combined data. Meanwhile, the highest values of number of branches/plant, number of pods/plant, weight of seeds/plant, weight of pods/plant, 100-seed weight, pods yield/fed and seed oil percentage were recorded when peanut was intercropped with maize SC 128 in 2011 and 2012 seasons as well as combined data. There were no significant differences between SC 122 and SC 128 in terms for the mentioned traits. Differences in the effect of maize on studied characters of peanut in this study might be due to differences in their genetic makeup. These results are in agreement with those reported by Abd El-Motaleb and Yousef 1998 as well as Nofal and Attalla 2006.

Peanut pods yield/fed was significantly reduced by maize hybrids compared with sole peanut in both seasons as shown in Table (5). Pods yield/fed behaved the same trend of the previous characters. Peanut pods yield/fed reduction is quite expected due to the competition the shading effect of maize plants which depressed most of yield components of groundnut plants . The highest pods yield /fed was produced with SC 128 follows by SC 122, followed by TWC 310, respectively. Similar results were obtained by Freire and Reddy 1989, Jana and Saren 1998 and Nofal, Fatma and Attalla 2006.

Table (5): Effect of maize hybrids on yield, yield components and oil seed percentage of peanut, (combined data of bath seasons).

Characters	Plant height (cm)	No. of branches/ plant	No. of pods/ plant	Wt. of seeds/ Plant (g)	Wt. of Pods/ plant(g)	Shelling %	100-seed weight (g)	Pods yield/fed (Ard/fed)	Seed oil %
SC 122	51.28	7.34	24.46	20.99	35.67	58.80	63.74	17.51	46.74
TWC310	52.04	6.73	23.34	20.57	35.00	58.73	62.17	16.16	46.16
SC 128	53.32	7.74	25.88	22.28	37.38	59.62	64.03	17.76	46.90
$LSD_{00.5}$	1.13	0.85	1.15	0.60	1.13	NS	1.19	1.28	0.40
Pure 122	54.15	8.16	28.00	23.31	39.44	59.10	67.90	21.70	46.14
Pure 310	54.78	7.54	26.50	22.80	37.83	60.26	66.58	21.25	46.62
Pure 128	56.45	8.48	28.70	24.40	38.66	63.11	67.43	21.55	47.25

2- Effect of intercropping patterns:-

Data presented in Table (6) indicated that growth, yield and yield components of groundnut were significantly affected by different intercropping patterns. Results shows that these characters were reduced compared with pure groundnut. Intercropping pattern (100 % groundnut +16.7%. maize) gave the highest followed by (100% groundnut +25 % maize4) followed by (100 % groundnut +33% maize) and (100% groundnut + 50 % maize) gave the lowest in both seasons. This was completely true for plant height, number of branches and pods / plans, weights of seed of seeds pod / plant and 100- seed weight. The marked reduction for these traits was obtained when maize was intercropped at high population density. This is was mainly due to the great increase of interspecific competition among maize plants and intercropping competition among maize and groundnut plants at 50 % of maize pure stand. The increase in these traits was due to the fact that interspecific competition is lower than intraspecific competition.

Shelling percentage was significantly affected by intercropping pattern in one season only as shown in Table (6). This trait is mainly considered as an inheritance character for certain variety and rarely affected by cultural treatments.

The highest pods yield /fed, was produced with the treatment including (100 % groundnut +16.7%. maize) followed by (100 % groundnut +25 %. maize) followed by (100 % groundnut + 33 %. maize) and then (100 % groundnut +50 %. maize) which was the lowest. The reduction in pods yield /fed of peanut was quit. Expected due to the competition of maize plants and the shading effect which depressed most of peanut yield component. Similar results were obtained by Dutta and Bandyopadhyay 2006, Adhikari *et al.* 2005, Mandimba *et al.* 1993, Freire and Reddy 1989, Jana and Saren 1998 Abd El-Zaher *et al.* 2007, Nofal and Attalla 2006

3-Intercation effects:-

Maize cultivars× intercropping systems interaction:

Data in Table (7) revealed that the effect of interaction between maize cultivars and intercropping system was significant for weight of seeds/plant, weight of pods/plant, weight of 100-seed and pods yield/fed. Results shows that intercropping SC 128 maize hybrids on the other side of the sixth peanut ridges gave the highest simultaneously, TWC 310 maize hybrids when intercropped on the other side of the second peanut ridge gave the lowest value. This is completely true for weight of seed and pods/ plant, weight of 100-seeds and pod yield/fed in both seasons and combined data.

Table (6): Effect of intercropping systems on growth, yield, yield components and oil seed percentage of peanut (combined data of bath seasons).

Characters	Plant Height (cm)	N. of branches/ plant	N. of pods/ plant	Wt. of seeds/ Plant (g)	Wt. of Pods/ plant(g)	Shelling %	100-seed weight (g)	Pods yield/fed (Ard/fed)	Seed oil %
1:1	51.22	6.61	22.91	20.27	35.09	58.60	61.18	14.74	45.60
1:2	51.76	7.13	24.20	20.99	35.72	59.33	63.02	16.64	46.44
1:3	52.78	7.44	25.26	21.67	36.38	60.43	64.19	18.21	47.02
1:4	53.09	7.89	25.88	22.19	36.90	60.04	64.86	18.98	47.33
LSD0.05	1.20	0.80	1.15	0.93	0.97	NS	1.13	2.55	0.60
Pure122	56.45	8.16	28.00	23.31	39.44	59.10	67.90	21.70	46.14
Pure310	54.78	7.54	26.50	22.80	37.83	60.26	66.58	21.25	46.62
Pure128	54.15	8.48	28.70	24.40	38.66	63.11	67.43	21.55	47.25

Table (7): Effect of the interaction of maize hybrids and intercropping systems on, weight of seeds/plant, weight of pods/, weight of 100-seed and grain yield/fad, of combined data of bath seasons.

characters		Weight of seeds/plant (g)	Weight of pods/plant(g)	Weight of 100-seed (g)	Pods yield (Ard/fed)
Giza 122	1:1	19.97	34.56	61.80	15.01
	1:2	20.49	35.25	63.44	17.37
	1:3	21.46	36.23	64.58	18.43
	1:4	22.03	37.33	65.19	19.23
TWC 310	1:1	19.62	34.25	59.81	14.11
	1:2	20.35	34.68	62.00	14.99
	1:3	20.92	35.26	63.22	17.33
	1:4	21.40	35.87	63.67	18.22
Giza 128	1:1	21.21	36.48	61.90	15.11
	1:2	22.13	37.23	63.60	17.56
	1:3	22.63	37.65	64.80	18.85
	1:4	23.15	38.18	65.79	19.49
$LSD_{0.5}$		1.94	2.28	3.21	3.10

Competitive relationships and yield advantage of intercropping:-

1-Land Equivalent ratio (L.E.R)

Results showed that maize hybrids X intercropping patterns proved advantages in all treatments as average of both seasons as shown in Table (8). The highest land usage was 1.32, which was recorded when SC 122 was planted the other side at the second ridge of peanut. Peanut was the higher contributed with higher (LP) values in all treatments compared with (LM) values of maize.

2- Relative Crowding Coefficient (K)

Data presented in Table (8) revealed that Crowding Coefficient had higher than the unit which is an advantage in all intercropping patterns in both seasons and combined data. The highest RCC values were achieved by the intercropping pattern including 100 % peanut + 50 % maize when maize plant(hybrid SC 128) which recorded the highest value for (RCC) (9.44) ,whereas the lowest value was recorded with intercropping pattern of 100 % peanut + 33 % maize when maize hybrid TWC 310 was used (RCC =1.53) .The yield advantage occurred because the component crops differ in their utilization of growth resources when grown in association and were able to complement each other and became able to maximize overall use of macro and micro environmental resources than when grown separately. These results are in agreement with those of Abd El-Zaher *et al* (2007)

3- Aggressivity (Agg):

Aggressivety indicated that maize was the dominant component in all treatments, whereas peanut was the dominated as shown in Table (8). The present results indicated that maize as the over story intercrop has higher competitive abilities than peanut as the understory component. On the other hand, the lowest land usage was 1.10, which showed with TWC 310 when it was planted on the other side at the fourth ridge of peanut.

Table (8): Competitive relationships, yield advantage and economic evaluation of intercropping maize hybrids with peanut (combined analysis).

varieties	Cropping patterns	Land Equivalent ratio			Aggressivity		Relative crowding coefficient			Total income(LE)		
		LER_{LM}	LER_{LP}	LER	Ag M	Ag P	KM	KP	RCC	Peanut Price (LE/fed)	Maize Price (LE/fed)	Total (LE/fed)
SC 122	1:1	0.63	0.69	1.32	0.85	-0.85	3.43	1.12	3.85	8360.6	4272.3	12632.9
	1:2	0.46	0.80	1.26	0.76	-0.76	2.52	1.33	3.34	9675.1	3090.6	12765.7
	1:3	0.40	0.85	1.25	0.92	-0.92	2.62	1.41	3.69	10265.5	2675.5	12941.0
	1:4	0.30	0.89	1.19	1.09	-1.09	2.62	1.25	3.26	10711.1	2014.9	12726.0
TWC 310	1:1	0.61	0.66	1.37	0.84	-0.84	3.11	0.99	3.07	7859.3	4038.9	11898.2
	1:2	0.43	0.71	1.14	0.76	-0.76	2.23	0.79	1.76	8349.4	2826.9	11176.3
	1:3	0.32	0.82	1.14	0.56	-0.56	1.83	1.11	1.53	9652.8	2093.7	11746.5
	1:4	0.23	0.87	1.10	0.63	-0.63	2.83	1.07	3.02	10148.5	1524.1	11672.6
SC 128	1:1	0.63	0.85	1.48	0.645	-0.645	3.45	2.74	9.44	8416.3	4345.0	12761.3
	1:2	0.48	0.71	1.19	0.96	-0.96	2.72	0.77	2.11	9780.9	3263.3	13044.2
	1:3	0.40	0.83	1.23	0.93	-0.93	2.01	1.10	2.21	10499.5	2751.2	13250.7
	1:4	0.30	0.87	1.17	1.15	-1.15	2.68	1.12	2.99	10855.9	2084.6	12940.5

3-Total income (LE)

Data presented in Table (8) indicated that the advantage of intercropping treatments of peanut patterns and maize expressed in terms of the farmer. The evaluation of different intercropping pattern of maize with peanut was made and the net income of the two components as compared with the pure stand relative to market price (Table 8).The highest values of total income (L.E. /fed.) were achieved by using SC 128 was grown in 1:3 system (13250.7 L.E), whereas using TWS 310 grown in 1:2 intercrop system gave the least peanut income, (11176.3 L.E). Similar results were reported by Abd El-Zaher *et al* (2009).

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تقييم بعض أصناف الذرة الشامية تحت نظم تحميل مختلفة مع الفول السودانى

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الملخص العربى

أقيمت تجربه حقليه بمحطه البحوث الزراعيه –محافظه الاسماعيليه خلال موسمى الزراعه ٢٠١١-٢٠١٢ لدراسه تأثير بعض أنماط التحميل (١٠٠% + ٥٠% ، ١٠٠%+ ٣٣% ، ١٠٠% + ٢٥% ، ١٠٠% + ١٦,٧ % فول سودانى / ذره شاميه) وثلاثه أصناف ذره شاميه(هجين فردي ١٢٢ و هجين فردي ١٢٨ هجين ثلاثي ٣١٠)على النمو والمحصول ومكوناته لكلا المحصولين، واستخدم تصميم القطع المنشقه مره واحده فى ثلاثه مكررات حيث وضعت الاصناف فى القطع الرئيسيه وأنماط التحميل فى القطع المنشقه.

ويمكن تلخيص أهم النتائج المتحصل عليها كالاتى :-

١- الذرة الشامية

أظهرت النتائج أن صنف الذره الشاميه هجين فردى ١٢٨ أعطى أعلى القيم لصفات المحصول ومكوناته بينما أعطي هجين الذره الشاميه الثلاثى هـ.ث٣١٠ أقل القيم لتلك الصفات فى كلا الموسمين. أدت زياده نسبه تحميل الذره الشاميه مع الفول السودانى من ١٦.٧ % الى ٢٥% الى ٣٣% الى ٥٠% الى نقص تدريجى فى مكونات محصول الذره الشاميه بينما حدث العكس لمحصول الفدان.

- تأثرت صفات طول النبات ، وزن حبوب الكوز ، وزن الكوز ، ووزن ١٠٠ حبه والمحصول معنويا بالتفاعل بين عاملى الذراسه فى كلا الموسمين.

٢- الفول السودانى

أشارت النتائج إلى حدوث نقص معنويا لكل الصفات المدروسه للفول السودانى ماعدا صفه معدل التفريط فى كلا الموسمين.

سجل نمط التحميل (١٠٠% فول سودانى + ١٦.٧ % ذره شاميه) أعلى القيم لمحصول الفول السودانى ومكوناته ، بينما سجل نمط التحميل (١٠٠% فول سودانى + ٥٠% ذره شاميه) أقل القيم خلال موسمى الدراسه.

أدى التفاعل بين عاملى الدراسه الى تأثير معنوى لصفات وزن بذور النبات ، وزن قرون النبات ،وزن ١٠٠ بذره ومحصول الفدان خلال الموسمين.

٤- العلاقات التنافسية

زاد معامل استغلال الارض (LER) لكل المعاملات خلال موسمى الدراسه وكان محصول الذره الشاميه هو المحصول السائد بينما محصول الفول السودانى هو المسود.

٥- العائد الإقتصادي

تراوحت الزياده فى العائد الكلى تحت ظروف التحميل بين (١١١٧٦.٣ و١١٣٢٥٠.٧) مقارنه بالفول السودانى المنفرد كمحصول رئيسى خلال موسمى الدراسه.

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