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OPTIMIZING UTILIZATION OF NITROGEN FERTILIZER UNDER SOME INTERCROPPING SYSTEMS OF GROUNDNUT AND MAIZE IN SANDY SOIL

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ABSTRACT

Two field experiments were conducted at the agricultural research station in North Sinai Governorate during the two seasons of 2003 and 2004 the aime of this study was optimizing nitrogen fertilization utilization and preferable nitrogen dose add to intercropping peanut (Giza 5) with maize (S.C.10) under two planting systems; bed and ridge. Sex doses of nitrogen were added to both crops i.e., 40 kgN/fed. (recommended nitrogen dose for solid peanut in desert), 125 kg N/fed (recommended nitrogen dose for solid maize), 145 kg N/fed. (recommended nitrogen dose for maize + 1/2 recommended nitrogen dose of peanut), 102.5 kgN/fed (recommended nitrogen dose of peanut + 1/2 recommended nitrogen dose of maize), 82.5 kgN/fed. (1/2 recommended nitrogen dose of both crops), 165.0 kgN/fed. (recommended nitrogen dose of both crops together), and two recommended doses for both solo crops (125 kgN/fed. for maize and 40 kgN/fed. for peanut in the sandy soil). Split plot design in 4 replications was used. The main plots were devoted to planting systems and the sub-plots were devoted to nitrogen doses. Peanut was planted on all the ridges on one side and on the beds on both sides in hills at distance of 10 cm and thinned to two plants/hill, the plant densities of both of ridge and bed systems were 140,000 plants/fed. Maize was planted on the other side of the ridge in hills at distances 30 cm, plant thinned on one plant/hill and left one ridge free, while in bed systems maize was planted in the middle of the bed at same distances of ridges, the plants were thinned on two plants/hill. Maize plant densities in both systems were 23200 plants/fed. The main results obtained from this study could be summarized as follows:

1- The highest peanut yield was obtained when planted on ridges, while maize gave highest grain yield when planted on beds.
2- The highest peanut yield/fed was obtained by fertilization with 102.5 kgN/fed. The other traits studied behaved the same way except plant height which gave the longest plants at 165 kgN/fed, while maize crop gave the highest grain yield when nitrogen rate at 145 kgN/fed was used, the other characters under study took the same trend except plant height which gave the longest plant at nitrogen rate 165 kgN/fed. In both crops lowest yields were obtained at nitrogen rate of 40 kg/fed.
3- The best economical yield from peanut and maize may obtained by nitrogen fertilizer level 145 kgN/fed.
4- It could be recommend that for maximizing total intercropped yield per unit area from peanut by planting on ridge or maize by planting on bed system with addition of 145 kg N/fed under the environmental condition of sandy soil.

INTRODUCTION

The competition of summer crops grown in Nile Delta with groundnut on the area devoted for groundnut push the researchers to find place to plant summer crops-like maize- in the same area as intercropped crops. Several investigators reported yield advantage and more net return per unit areas when peanut was intercropped with some other crops. Among them are Abd-

El Motaleb and Yousef (1998), reported that intercropping maize at 25% or 50% of its full pure stand density with peanut increased pod yield /fed.

From other side maize is consider as a very important cereal crop for human and animal consumption. Maize is one of the major cereal crop grown in Egypt. It ranks the third position among cereal crops. At low populations (50% density/fed.), yield is limited by the number of maize plants (Larson and Haway. 1977) when intercropping, the competition for water as well as light and nutrients determine optimum plant density for each crop, highest LER values and highest grain yield was obtained when 50% maize was intercropped with peanut when maize planting on row and left row without planting (Samira *et al.*, 2002). In many countries, intercropping often is the way to increase and maximizing the productivity of unit area. Eventually intensive cropping is an important target in this way. Intercropping maize with peanut could be considered as on ideal example towards intensive cropping in sandy soil.

The research aimed also to investigate optimum nitrogen fertilizer rate at different intercropping systems of maize and peanut to save the fertilizer leaching and reach to minimum dose of nitrogen gave maximum income. El-Kassaby and El-Kalla (1981) and Khedr (1986), reported that grain yield/fed. grain yield/ear, ear length and diameter, number of grains/row, 100-grain weight and maize plant height gradually increased as rate of N was increased up to 120 kg N/Fed. In sandy soil and under drip irrigation system, Samira *et al.* (1998), found that the highest values of grain yield/fed. obtained when maize was received 125 kg. N/fed. Plant density of peanut was 140.000 plant/fed. 60 cm between ridges, 10 cm between hills of peanut and left two plants/hill. Nitrogen fertilizer rate at 45 kg N/Fed gave the highest yield under sandy soil condition with drip irrigation system (Samira *et al.* 2000).

MATERIALS AND METHODS

The present investigation was performed in experimental station at wadi El-Areish, North Sinai Governorate during 2003 and 2004 growing seasons. The aim of this experiment was to study the effect of different doses of nitrogen fertilizer which maximizing production and minimizing leaching of fertilizer of intercropped peanut with maize. Under two planting systems like; bed system (wide ridge 120 cm. width) and ridge system (60 cm. width), peanut was the main crop and maize was the overstory crop which intercropped on peanut crop. Drip irrigation and fertigation were used in this study. Soil samples were taken from different places representative the experimental sites for analysis. Average of mechanical and chemical analysis of soil of two growing seasons are presented in Table 1 which show that Mechanical and chemical of soil analysis of the two seasons illustrated in table 1. As seen from Table (1), soil was moderate in salinity and alkalinity of both seasons. Soil had low available contents of N, P,K and organic matter content in both seasons. The texture of soil was sandy. Also the soil had low

content of micro-nutrients i.e. Fe, Mn and Zn. While micro-nutrients Fe, Mn, Zn and B were low if their limits <2, <1.8, <1.0 and <0.01 ppm respectively.

Table 1: Mechanical and chemical characteristics of the experimental site during the two seasons

Characters		Mechanical analysis	
		First season	Second season
Clay	%	2.2	4.9
Silt	%	5.3	8.5
Fin sand	%	62.2	61.4
Coarse sand	%	29.4	24.5
O.M	%	0.8	0.6
Texture		Sandy	Sandy
		Chemical analysis	
$CaCO_3$	%	3.9	4.4
Aval. N ppm		32.0	30.2
Aval. P ppm		7.9	9.5
Aval. K PPm		141	128
pH*		8.9	8.4
E.C. ppm		4.7	4.8
Fe ppm		1.05	1.09
Mn ppm		0.80	0.75
Zn ppm		0.07	0.07
B ppm		0.005	0.006

* 1:2.5 Soil- water suspension. - N according to Jackson (1967).
- P according to Olsen et al (1954). - K according to Jackson (1967).

A split plot design in 4 replications was used in this investigation, the main plot was devoted to the following planting systems:
a) Bed system (wide ridge with width 120 cm).
b) Ridge system (ridge width 60cm).

In both systems: 1) Peanut seed was planted on one side of the ridge (60 cm), 10 cm between hills, while on the bed system (120 cm) peanut seed was planted on both side of the bed with 10 cm distance between hills, in both systems thinned to two plants/hill, density of peanut in both systems was 140.000 plant/fed. 2) Maize grains in ridge system were planted on the other side of the ridge at distant 30 cm, thinned on two plants/hill alternated with one ridge of peanut left free, while in bed system grains of maize was planted on the middle of each back of bed at distance 30 cm, plants thinned to two plants/hill. Maize density in both systems was about 23200 plants/fed. (densities of both crops were 100% peanut and 100% maize/fed.) and the sub plot area was 21 m^2 (7.0 x 3) containing 10 rows which devoted to nitrogen fertilization in six treatments in the intercropped peanut with maize as follow:

1- The recommended amount of nitrogen fertilizer for peanut only (40 kg N/fed.)
2- The recommended amount of nitrogen fertilizer for maize only (125 kg N/fed.)

3- The recommended amount of nitrogen fertilizer for maize + 1/2 recommended amount of nitrogen fertilizer for peanut (125 kg N + 20 kg N = 145 kg N/fed).
4- Half amount of nitrogen fertilizer for maize + recommended amount of nitrogen fertilizer for peanut (62.5 Kg N + 40 kg N /fed = 102.5 kg N/fed)
5- Half amount of recommended nitrogen fertilizer for maize + half amount of recommended nitrogen fertilizer for peanut (62.5 Kg N+ 20 kg N = 82.5kg N/fed.)
6- Recommended amounts of nitrogen fertilizer for maize + peanut (125 kg N + 40 Kg N = 165 kg N/fed.).
7- Peanut solo and maize solo which received 40 and 125 kg N/fed. respectively.

Drip irrigation system was used. Laterals were done at 60cm apart, are line for each ridge, whereas in bed system laterals located at one line for each side of bed and one line on the middle of the bed for maize which planted on the middle of the bed.

Calcium superphosphate (15.0% P_2O_5) at the rate of 250 kg/fed was added during land preparation. Potassium sulphate (50% K_2O) at the rate of 50 kg/fed., half the amount was added with superphosphate at land preparation and the rest amount was added after 60 days from planting. The other usual agricultural practices of maize and peanut were dore as recommended of Agric Res. Center. Nitrogen treatments at above rates were excuted as calculating the total amount of nitrogen unit for maize and peanut together and added one third of this amount in form of ammonium sulphate (20.6%N) during the preparation of the soil with superphosphate and potassium sulphate, and rest amount of nitrogen added to the plants in two equal doses in form of ammonium nitrate (33.5% N) first one after 3 weeks from planting and other dose after first one with 4 weeks.

Peanut variety "CV Giza 5" was sown at a rate of 30 kg seeds fed. on 25th of April and 2nd of May in the first and second seasons respectively. Maize (S.C-10) was seeded at a rate of 10kg/fed as pure stand after 15 days from peanut sowing, as a recommendations of Samira *et al.* (2002).

Samples of 10 graded plants from each sub plot at grain maturity stage were taken to recording the following characters for each crop.

Peanut data: Plant height (cm), number of branches/plant, number of pods/plant, 100-seed weight (gm), filling%, shilling%, oil% and pods yield/fed (ardab). Seed oil content percent which was determined using soxhelet's extraction method according to A.O.A.C. (1984). Maize data: plant height (cm), stem diameter (cm), Leaf area/plant (cm^2), ear length (cm), car diameter (cm), Kernels weight/ear (gm), 100 kernels weight (gm) and grain yield (ardab/fed.). Regarding to economic evaluation, the price of maize was 160 L.E. for one ardab and was 200 L.E. for one ardab of peanut, (MOA), the price of nitrogen fertilizer rates was calculated according to the market price for the trail expermentation time. The total cost was calculated only for the price of nitrogen for the net of income per unit area.

Obtained data were subjected to the statistical analysis as the usual technique of analysis of variance (ANOVA) of the split-plot design as mentioned by Gomez and Gomez (1984). The treatments means were

compared using the newly least significant Difference (N.LSD) as the procedures outlined by Waller and Duncan (1969).

RESULTS AND DISCUSSION

A- Effect of planting systems:

1- Peanut:

Results in Table 2 show the effect of planting systems (ridge and bed) on growth yield and yield attributes of peanut during the two seasons. Results revealed that number of branches/plant, number of pods/plant, 100-seed weight and pods yield (ardab/fed.) were significantly affected by the two systems of planting. Growing peanut in ridge system gave the higher number of branches/plant, pods number/plant100-seed weight and consequently the pods yield/feddan. But did not significantly differ in the other traits compared with the bed sysetm may be attributed to the formulation of the ridge that it increase the aeration around the roots, promote the roots grow fustily and help the pigs to penetrate the soil easier as a result of covering the pigs with more soil which take from the other side of the ridge. These results are in nearly relationships with those obtained by Bhagwandin and Bhatia (1990), Jadhav *et al.* (1993) and Haikel and El-Melegy (2000).

2- Maize:

Data in Table 3 showed the effect of planting systems on growth, yield and yield components of maize during the two growing seasons. Results evidenced that all the estimated characters were significantly affected by the two systems of planting in both seasons. The results revealed that bed method gave the highest values for all the studied characters. The superiority of bed system may be attributed to no competition done between maize and peanut plants to nutrition, because maize plants planted on the middle of bock of the bed, while peanut plants planted on the both sides of the bed, also because maize from the type of the plants " C4 plants" and the light is important factor to increase photothynsis due to less competition to light density, the bed system encouraged light penetration to the understory component (peanut) more than ridge system which is distinctive with more dens maize plants and in turn diminished light penetration to peanut plants. Similar trends on both traits as influenced by maize shading were obtained by Ibrahim, Sahar (2000) and Samira *et al.* (2002).

B- Effect of nitrogen fertilization rates:

1- Peanut:

Results in Table 2 indicated that plant height, number of branches/plant, number of pods/plant, 100- seed weight, filling percentage and yield (ardab/feddan), while shilling percentage and oil percentage which failed to reach the 5% level of significance. The shortest plants were obtained when the plants (peanut and maize) received the nitrogen fertilizer of peanut only (40 kg N/fed), however the tallest plants were obtained when received 165 kg N/fed (more nitrogen gave more plant height), while the others

significantly characters i.e. number of branches/ plant, number of pods/plant, 100-seed weight, filling percentage and pod yield/fed. gave the highest values at rate of 102.5 kg nitrogen/fed. which coming from half of nitrogen fertilizer for maize (62.5 kg N/fed.) + all recommended dose of nitrogen fertilizer for peanut (40 kg N/fed.). This meaning that dose is optimum nitrogen fertilizer suitable to fertilize intercropping peanut and maize. It is important mention here, that peanut pod yield/fed was the highest yield when peanut was intercropped with maize plants comparing with solo planting, this share attributed to the peanut plants (C_3 plant) benefit from shading of maize plants during high temperature in summer season, this help the pig grow and penetrate soil easier and successfully. (Samira *et al.* 2002).

2- Maize:

Results in Table 3 indicated that all the studied characters significantly affected by nitrogen fertilization doses in both seasons. Plant height show higher to maximum dose of nitrogen 165 kg N/fed. which came from recommended dose of nitrogen fertilizer for peanut and recommended dose of nitrogen fertilizer for maize. On the other side, stem diameter, leaf area/plant, ear length, ear diameter, kernels weight/ear, 100- Kerneis weight and grain yield/fed. had the highest values at 145 kg N/fed. (recommended of nitrogen fertilizer for maize (125 kg N/fed.) + half amount of nitrogen fertilizer dose for peanut (20 kg N/fed). The incerements occured in the characters of yield components. On the other hand, it could be expected that maize plants fertilized will from each of phosphorus and potassium at nitrogen rate of 145 kgN/fed (Samera *et al.* 1998).

Interaction effects:

1- Peanut:

From Table 4, the trend of this interaction on growth, yield and yield components of peanut logical acceptance, plant height, 100-seed weight, shilling % and oil% were not significantly affected with the interaction between the two factors studied, while number of branches/plant, number pods/plant, filling% and pods yield/fed were affected. So, it may consider that the ridges systems were the suitable way to covering root area with the soil by hoe which resulted higher yield, filling pods and more of branches/plant than bed method which associated with high dose of nitrogen (102.5 kg N/fed.) than that the recommended for peanut when planted alone (40.0 kgN/fed.). On other hand the highest yields were obtained by intercropping peanut with maize were grown on ridge (60 cm width) with nitrogen fertilizer rate of level 102.5 kg N/fed.

2- Maize:

From Table 5, results revealed that the interaction effects between planting systems and nitrogen levels on yield and yield components behaved the same as the main factors behaved individually, the results indicated that there were gradual increases in grains yield and its components with increasing nitrogen levels over the two systems of planting.

Table 2:Effect of planting systems and different nitrogen fertilization levels on some characters of intercropped peanut with maize in the two seasons 2003 and 2004.

Treatments	Plant height (cm)		No. of branches/ plant		No. pods/plant		100-seed weight (g)		Yield (ardab)/fed		Filling %		Shilling %		Oil %	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
Planting systems:																
Ridge	50.8	49.4	6.3	6.1	30.4	29.8	76.1	75.5	11.10	10.92	88.2	87.9	58.5	57.8	43.3	42.9
Bed	48.2	48.8	5.9	5.7	29.6	29.3	70.8	70.3	10.60	10.32	88.0	87.6	57.9	57.4	43.2	42.6
F-test	NS	NS	**	**	**	**	*	*	*	*	NS	NS	NS	NS	NS	NS
Nitrogen fert. rate:																
40 kg N./fed. (Rec. peanut only)	29.0	28.7	4.7	4.5	23.9	23.5	62.9	62.1	8.70	8.30	87.4	87.1	50.6	49.8	43.0	42.3
125 kg N./fed. (Rec. maize only)	54.1	53.9	4.8	4.6	27.5	27.2	69.0	68.6	9.90	9.60	87.3	87.2	57.8	57.2	43.7	43.4
145 kg N./fed. (Rec. maize+ 1/2 Rec. peanut)	57.0	56.8	4.9	4.8	29.4	29.0	68.3	68.0	11.11	10.85	88.6	88.2	55.9	55.2	42.9	42.6
102.5 kg N./fed. (1/2 Rec. maize + Rec. peanut)	49.7	48.9	7.6	7.5	34.7	34.3	79.6	79.2	12.76	12.50	89.4	89.1	61.8	61.6	43.7	42.9
82.5 kg N./fed. (1/2 Rec. maize + 1./2 Rec. peanut)	43.0	42.6	7.1	6.7	33.0	31.1	79.5	78.9	10.20	10.10	88.8	88.4	60.9	60.3	42.9	42.6
165 kg N./fed. (Rec. maize+ Rec. peanut)	61.4	60.9	5.7	5.5	26.0	25.7	71.2	70.6	11.20	10.90	87.1	86.9	58.0	57.6	42.5	42.0
Peanut solo (40 kg N./fed.)	52.5	52.2	8.0	7.9	36.8	36.4	83.6	82.9	12.35	12.15	88.3	88.0	62.6	62.1	43.9	43.5
F-test	**	**	**	**	**	**	**	**	**	**	**	**	NS	NS	NS	NS
N.L.S.D. 0.01	1.3	1.2	0.3	0.2	0.9	0.8	2.4	2.0	0.30	0.25	0.9	0.8				
Interaction effect:																
A x B	NS	NS	*	*	*	*	NS	NS	*	*	*	*	NS	NS	NS	NS

Table 3: Effect of planting systems and different nitrogen fertilization levels on some characters of intercropped maize with peanut in the two seasons 2003 and 2004

Treatments	Plant height (cm)		Stem diameter (cm)		Leaf area (cm^2/plant)		Ear length		Ear diameter (cm)		Kernels weight/ear (g)		100-kernels weight (g)		Yield (ardab/fed.)	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
Planting systems:																
Ridge	196.0	193.8	2.7	2.6	660.9	656.8	18.4	18.2	3.3	3.2	35.5	34.8	33.7	32.9	14.10	14.10
Bed	206.0	204.3	2.8	2.7	683.4	675.5	19.5	18.9	3.5	3.4	39.6	39.0	36.6	35.8	15.70	15.74
F-test	*	*	*	*	**	**	*	*	*	*	**	**	**	**	**	**
Nitrogen fert. of rates:																
40 kg N./fed. (Rec. peanut only)	121.6	120.2	2.2	2.0	505.1	485.1	11.5	11.6	2.1	2.0	21.8	21.4	26.8	26.2	6.67	7.30
125 kg N./fed. (Rec. maize only)	226.9	219.5	3.1	3.0	741.7	739.5	21.4	21.0	3.9	3.7	45.6	44.2	38.3	37.2	16.64	16.55
145 kg N./fed. (Rec. maize+ 1/2 Rec. peanut)	239.9	238.2	3.3	3.1	736.8	734.6	23.0	21.8	4.4	4.3	46.6	43.7	41.8	41.0	17.15	17.30
102.5 kg N./fed. (1/2 Rec. maize + Rec. peanut)	170.5	169.5	2.2	2.1	640.2	635.5	16.4	16.8	2.4	2.3	29.0	28.0	28.9	28.0	14.00	14.10
82.5 kg N./fed. (1/2 Rec. maize + 1./2 Rec. peanut)	160.9	160.2	2.1	2.2	610.1	604.8	15.3	14.3	2.2	2.3	27.3	26.9	26.0	27.4	12.00	12.65
165 kg N./fed. (Rec. maize+ Rec. peanut)	243.0	241.7	3.2	3.1	736.8	728.6	22.7	22.0	4.3	4.1	45.3	44.8	40.2	39.1	16.81	16.35
Maize solo (125 kg N./fed.)	244.1	243.9	3.4	3.2	734.5	731.3	22.5	22.3	4.4	4.1	47.4	46.3	42.5	41.7	20.90	20.10
F-test	*	*	*	*	**	**	**	**	**	*	**	*	**	**	**	**
N.L.S.D 0.01	12.4	12.0	0.1	0.15	8.7	7.8	0.4	0.5	0.3	0.2	1.0	0.9	0.8	0.5	0.75	0.81
Interaction effect:																
A x B	NS	NS	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Table 4: Interaction effects of sowing systems and different of nitrogen fertilization levels on some characters of intercropped peanut with maize in the two seasons 2003 and 2004.

Planting systems / N. fertilization	No. of branches/plant				No. of pods/plant				Yield (aradab/fed)				Filling %			
	2003		2004		2003		2004		2003		2004		2003		2004	
	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed
40 kg N./fed. (Rec. peanut only)	4.7	4.6	4.5	4.4	24.2	23.5	24.7	22.2	8.7	8.6	8.4	8.2	87.7	87.5	87.4	87.1
125 kg N./fed. (Rec. maize only)	4.8	4.7	4.7	4.5	27.9	27.2	27.5	26.9	10.3	9.4	10.2	9.0	87.4	87.2	87.1	86.9
145 kg N./fed. (Rec. maize+ 1/2 Rec. peanut)	5.2	4.7	5.0	4.6	29.7	29.0	29.7	28.2	11.4	10.8	11.4	10.3	88.6	88.4	88.3	88.0
102.5 kg N./fed. (1/2 Rec. maize + Rec. peanut)	7.7	7.4	7.5	7.4	35.1	34.3	34.6	34.0	12.9	12.6	12.4	12.6	89.5	89.3	89.2	89.0
82.5 kg N./fed. (1/2 Rec. maize + 1./2 Rec. peanut)	7.5	6.8	7.1	6.4	32.7	31.3	31.4	30.8	10.4	10.1	10.4	9.8	88.7	88.5	88.4	88.1
165 kg N./fed. (Rec. maize+ Rec. peanut)	5.6	5.6	5.6	5.4	26.7	25.3	26.0	25.3	11.6	10.8	11.5	10.3	87.4	87.1	87.1	86.7
Peanut solo (40 kg N./fed.)	8.3	7.8	8.0	7.4	37.6	36.0	36.8	36.0	12.5	12.2	12.2	12.1	88.4	88.2	88.1	87.9
N L.S.D. 0.05	0.3		0.2		0.6		0.5		0.24		0.21		0.2		0.1	

Table 5: Interaction effects of sowing systems and different of nitrogen fertilization levels on some characters of intercropped maize with peanut in the two seasons 2003 and 2004.

Planting systems / N. fertilization	2003											
	Stem diameter (cm)		Ear length		Ear diameter		Kernel weight (g)		100-kernels weight (g)		Yield (ardab/fed)	
	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed	Redge	Bed
40 kg N./fed. (Rec. peanut only)	2.1	2.2	10.4	12.6	2.0	2.2	21.0	22.6	24.7	26.3	5.89	7.45
125 kg N./fed. (Rec. maize only)	3.0	3.3	20.5	22.3	3.8	4.0	44.1	47.0	36.9	39.7	16.06	17.22
145 kg N./fed. (Rec. maize+ 1/2 Rec. peanut)	3.1	3.5	22.2	23.8	4.2	4.6	43.1	50.1	40.7	42.6	15.96	18.31
102.5 kg N./fed. (1/2 Rec. maize + Rec. peanut)	2.1	2.3	15.4	17.4	2.3	2.5	27.5	30.8	26.5	31.2	13.72	14.42
82.5 kg N./fed. (1/2 Rec. maize + 1./2 Rec. peanut)	2.0	2.2	14.2	16.3	2.2	2.3	26.0	28.3	27.0	29.1	11.61	12.38
165 kg N./fed. (Rec. maize+ Rec. peanut)	3.1	3.3	22.1	23.2	4.1	4.5	41.5	49.2	38.9	41.5	15.79	17.83
Maize solo (125 kg N./fed.)	3.7	3.2	23.9	21.1	4.1	4.6	44.9	49.9	41.7	43.4	19.71	22.00
N.L.S.D. 0.05	0.2		0.6		0.2		1.4		0.6		0.7	
	2004											
40 kg N./fed. (Rec. peanut only)	2.0	2.1	11.0	12.2	2.1	2.2	21.5	22.9	25.0	27.5	6.1	8.5
125 kg N./fed. (Rec. maize only)	2.8	3.1	20.5	21.6	3.4	3.6	42.6	44.7	36.0	39.0	15.5	17.4
145 kg N./fed. (Rec. maize+ 1/2 Rec. peanut)	3.0	3.2	21.5	22.1	4.2	4.3	41.4	46.0	40.0	42.0	16.5	18.4
102.5 kg N./fed. (1/2 Rec. maize + Rec. peanut)	2.0	2.2	16.0	17.6	2.3	2.5	27.0	29.9	26.6	28.4	13.7	14.4
82.5 kg N./fed. (1/2 Rec. maize + 1./2 Rec. peanut)	2.0	2.1	13.0	15.5	2.2	2.4	25.5	28.0	26.0	28.0	12.1	13.2
165 kg N./fed. (Rec. maize+ Rec. peanut)	3.0	3.2	21.5	22.6	4.0	4.2	42.9	46.8	38.8	40.3	15.2	17.5
Maize solo (125 kg N./fed.)	3.3	3.1	23.7	21.0	4.3	4.4	44.7	47.9	40.8	42.6	19.4	20.8
N.L.S.D. 0.05	0.1		0.5		0.1		1.2		0.5		0.6	

All the characters studied were affected with the interaction between the two factors study except plant height and leaf area/plant. Maximum values of stem diameter, ear length, ear diameter, kernels weight/ear, 100-kernels weight and yield (ardab/feddan) were obtained when planted in bed method under 145 kg N/fed. while the lowest values were obtained when maize plants were planted in ridge systems under 40 kg N/fed.

Economic evaluation and conclusion:

It could be concluded that the net income from the nitrogen fertilization of intercropping peanut with maize under different levels of nitrogen fertilizer was the highest when peanut intercropped with maize under nitrogen fertilization level 125 kg N/fed. because the rate was suitable for fertilization of both crops under intercropping system and decrease the relatively production costs enough to gaining two main yields from peanut and maize. The evaluation depended on the cost of nitrogen fertilization for production of two crops (input) and the income around the summer season from the unit area in Egyptian rounds from Table (6). It can be concluded that net income from unit area was the highest when peanut was intercropped with maize with nitrogen fertilization level 145 kg N/fed. Compared to the solo sowing of peanut and maize, respectively.

It could be recommend that the best yield from peanut intercropped with maize was obtained with N. rate 145 kgN/fed.

Table 6: Economical evaluation of nitrogen fertilization levels of intercropping peanut and maize over the two seasons.

Treatments	Total price of nitrogen	Yield (ard/fed.)		Income (L.E.)	Total income. (L.E).	Net profite tot. inc. – tot. price of N.
		Peanut	Maize	Peanut L.E./ard	Maize L.E./ard.	
40 kg N./fed. (Rec. peanut only)	90.8	8.5	7.00	1700.0	1120.8	2820.0
125 kg N./fed. (Rec. maize only)	283.8	9.75	16.55	1950.0	2730.8	4680.8
145 kg N./fed. (Rec. maize+ 1/2 Rec. peanut)	329.4	10.98	17.30	2196.0	2854.5	5050.5
102.5 kg N./fed. (1/2 Rec. maize + Rec. peanut)	232.8	12.63	14.05	2526.0	2318.3	4844.3
82.5 kg N./fed. (1/2 Rec. maize + 1./2 Rec. peanut)	187.3	10.15	12.33	2030.1	2029.5	4059.6
165 kg N./fed. (Rec. maize+ Rec. peanut)	374.9	11.05	16.58	2210.0	2735.7	4945.7
Solid peanut	90.8	12.25		2450.0		2450.0
Solid maize	283.8		20.1		3316.5	3316.5

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تعظيم الاستفاده من التسميد النيتروجيني لمحصولي الفول السوداني والـذرة الشـامي المحملين معا في الأراضي الرملية

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أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بالعريش بمحافظة شمال سيناء خلال موسـمي النمو ٢٠٠٣ ، ٢٠٠٤ لدراسة وتحديد أفضل جرعة من السماد النيتروجيني علي محصولي الفول السوداني (جيزه ٥) والأذرة الشامية (هجين فردي ١٠) المحملين معا وتحديد أفضل طرق الزراعة التحميلية للأذرة الشامية مع الفول السوداني في الأراضي الرملية. اشتملت الدراسة علي سـتة مسـتويات مـن التسـميد النيتروجيني تضاف إلي كلا المحصولين المحملين معا كما يلي: ٤٠ كجم نيتروجين للفدان (الجرعه الموصي بها للفول السوداني المنفرد)، ١٢٥كجم نيتروجين للفدان (الجرعه السمادية الموصي بها للـذره المنفـرد)، ١٤٥كجم نيتروجين للفدان (الجرعه الموصي بها للذرة المنفرد + ٢/١ الجرعة الموصي بها للفول السوداني المنفرد) ، ١٠٢,٥كجم نيتروجين للفدان (الجرعة الموصي بها للفول السوداني المنفـرد + ٢/١ الجرعـة الموصي بها للذرة المنفرد)، ٨٢,٥ كجم نيتروجين للفدان (نصفي الجرعة الموصي بها لكلا المحصولين)، ١٦٥ كجم نيتروجين للفدان (الجرعتان الموصي بهما لكلا المحصولين). علاوة علي التسميد الموصي بـه لكلا المحصولين للمقارنة مع المحاصيل المنزرعة منفرده (١٢٥ كجم نيتروجين للفدان للـذرة ، ٤٠ كجـم نيتروجين للفدان للفول السوداني في الأراضي الرملية). حيث تمت زراعة الفول السوداني علي جانبي جميع المصاطب وعلي جانب واحد لجميع الخطوط في جور علي مسافة ١٠سم وخفت علي نباتين بالجورة وبذلك تكون الكثافة النباتية للفول السوداني ١٤٠,٠٠٠ نبات للفدان في كلا الطريقين. أما الذرة الشامية فقـد زرع علي الجانب الأخر من الخط لزراعة الفول السوداني المنزرع علي خطوط مع ترك خط بدون زراعـة٢٠ وبالنسبة للمصاطب تم زراعة الذره في وسط المصاطب وتمت الزراعة علي مسافة ٣٠سم بين الجور وترك نباتين واحد بالجوره. وعلي ذلك تعتبر الكثافة النباتية الذرة الشامية٢٣٢٠٠ نبات للفدان في كـلا نظـامي الزراعة. استخدم تصميم القطع المنشقة في ٤ مكررات خصصت القطع الشقيه للتسميد النيتروجينـي أمـا القطع الرئيسية فقد خصصت لطرق الزراعة وقد اظهرت النتائج ما يلي:

١- أعلي محصول للفول السوداني تم الحصول عليه عندما زرع علي الخطوط أما الذرة فقد أعطي أعلـي محصول عندما زرع علي المصاطب.
٢- بالنسبة للتسميد النيتروجيني فقد أعطي الفول السوداني أعلي محصول عندما تم تسميده مع الذرة الشامية بجرعة ١٠٢,٥كجم نيتروجين للفدان وقد سلكت كل الصفات المدروسة نفس هذا السلوك فيما عدا صفة طول النبات التي أعطي أعلي قيمة عند التسميد بمعدل ١٦٥كجم نيتروجين للفدان أما أعلي محصول من الذرة الشامية تم الحصول عليه عندما تم تسميده مع الفول السوداني بمعدل ١٤٥كجم نيتروجين للفـدان وقد سلكت كل الصفات الأخري تحت الدراسة نفس السلوك ما عدا صفة طول النبات أيضا التي أعطت أعلي القيم عند التسميد بمعدل ١٦٥ كجم نيتروجين للفدان بينما في كلا المحصولين كان أقل محصـول تم الحصول عليه عند تسميدهما معا بمعدل ٤٠ كجم نيتروجين للفدان
٣- أعلي عائد اقتصادي تم الحصول عليه عند تسميد محصولي التحميل معا بمعدل ١٤٥ كجم نيتروجين للفدان.

توصي هذه الدارسة بتسميد الفول السوداني المحمل بالذرة الشامية المنزرع على خطوط (الفول السوداني) أو على مصاطب (الذرة الشامية) عند التسميد بمعدل ١٤٥ كجم نيتروجين للفدان تحت ظـروف الأراضي الرملية.