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EFFECT OF APPLIED N, P AND K ON PEANUT YIELD, QUALITY AND NUTRIENTS UPTAKE IN SANDY SOILS.

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ABSTRACT

Two field experiments were carried out at Ismailia Agricultural Research Station during 2011 and 2012 summer growing seasons to investigate the effects of applied N, P and K on peanut yield, quality and some macronutrients (N, P and K) uptake in sandy soils. Results showed that Ismailia-1 genotype surpassed Gregory genotype regarding plant growth, yield components and pod, seed quality except number of branches plant^{-1} and pod yield fed.$^{-1}$ and N, P and K uptake in peanut seeds.

Increasing N, P and K rates from (30-30-24 to 60-45-48kg NPK fed.$^{-1}$) significantly increased plant height, number of branches plant^{-1}, seed weightplant^{-1}, pod yield fed.$^{-1}$,100-pod weight, 100-seed weight, shelling % and N, P and K-uptake.

Results also showed that the interaction among genotypes and nitrogen, phosphorus and potassium fertilization had significant effects on all studied traits in both seasons. Also pod yield (kg fed.$^{-1}$) was positively correlated with all studied characters.

Generally, Ismailia-1 genotype as well as (60,45and 48 kg NPK fed.$^{-1}$) gave the highest values of most studied traits in the both seasons.

Kewwords: peanut, genotypes, N, P and K fertilization, sandy calcareous soil, N, P, K concentration, uptake.

INTRODUCTION

Peanut is considered one of the most important leguminous crops in Egypt. Peanut was grown in Egypt for oil production, fresh human consumption or export, since its cultivation is thrived in the reclaimed sandy soil. In addition, it has the ability for improving the physical structure as well as the fertility of such soil types. So many investigations carried out to raise peanut quantity and quality in sandy soil. Varieties of peanut vary in growth habit where some of them are semi-spreading and others are erect. Their root system may be varied in volume and size and may be of different capabilities to absorb nutrients .Several studies have addressed different aspects of the N fertilization. Mahmoud and EL-Far (2000) and Ali *et al.* (2010) concluded that applying N fertilizer up to 40 Kg ha^{-1} increased pod and seed yields ha^{-1} AL–Shormillesy and Abd El-Hameed (2006) found that increasing N- level from 30 Kg to 70Kg N fed.$^{-1}$ significantly increased gradually pod and seed yields (Kg fed.$^{-1}$) in both seasons. Ali *et al.* (2010) indicated that increasing N-levels from 30 Kg to 70 Kg N fed.$^{-1}$ increased oil yield, while the seed oil percentage was decreased. Emam (2012) reported that in addition nitrogen fertilization at 75 kg fed.$^{-1}$ caused a significant increase in peanut yield. Also, Pendashteh *et al.* (2011) found that 80 kg N

ha^{-1} gave significantly higher seed yield ha^{-1} than that of control treatment. Ali and Mowafy (2003) & Ismail and Abdel–Momen (2007) found positive and significant correlation between pod yield $fed.^{-1}$ and pod yield $plant^{-1}$, 100-pod weight, 100–seed weight and shelling%.

Phosphorus (P) and potassium (K) fertilization had intensively compared to those conducted on nitrogen (N). This might be attributed to the fact that adequate supplement of P is important for increasing nodule formation and increased N fixation in legume plants (Robson, 1983).Moreover, K has a beneficial effect on nitrogen fixation and transformation of photosynthesis products from leaves to the root nodules. Phosphorus fertilization was investigated by several workers who recommended varied dose of P_2 O_5 (Kg ha^{-1}) for raising yield and its attributes, 40 Kg ha^{-1} (Lai, 1988), 60 Kg ha^{-1} (Yakadri *et al*., 1992), 72 Kg ha^{-1} (Thimmegoroda, 1993), reported 25 and (30-30-50kg $fed.^{-1}$ NPK) gave the best combinations for high pod yield as well as oil and protein % for both Giza 4 and Giza 5 cultivars. EL-Sayed and Yousef (2003) reported 71 Kg P_2O_5 ha^{-1}.

With regard to potassium, (K) fertilization and its effect on yield and its components, several authors reported a positive yield response to K application. An increase was reported for plant height, no. of pods $plant^{-1}$, weight of pods and seeds $plant^{-1}$, 100- seed weight, seed yield $fed.^{-1}$, shelling % and fodder yield $fed.^{-1}$ Ahmed and Zeidan (2001) and Ali and Mowafy (2003).

Studies also indicated that different fertilization doses as K_2 O were adequate for both growth and yield of peanut. 30 Kg ha^{-1} (Ghatak *et al.*, 1997), 48 Kg $fed.^{-1}$ (Anton and Bassiem, 1998), 48 Kg $fed.^{-1}$, 36 Kg $fed.^{-1}$ (EL-Far and Ramadan, 2000) and 72 Kg $fed.^{-1}$ (Maha, 2004). Patra *et al*. (1995 a, b and c) reported that K application in peanut increased yield and its attributes as well as seed oil content. K application increased pod, Kernel and oil yields as well as concentration of N, P and K in plant parts (haulm, kernel and husk). Also, Nasr – Alla *et al*. (1998) reported that increasing the rate of PK individually or in combination increased growth and yield characters, Ali and Mowafy (2003) also, reported that potassium and phosphorus application significantly increased leaf chlorophyll content, vegetative and yield characters as well as seed oil % and yield.

El-Habbasha *et al.,* (2005) reported that increasing phosphorus levels increased each of weight $plant^{-1}$, number of pods and seed $plant^{-1}$, weight of pods and seeds $plant^{-1}$, 100 seed weight, seed yield and seed N, P and K content. Ibrahim and Eleiwa (2008) found that increasing NPK rate from half the recommended rate (30:30:25) to recommended rate (60:60:50) significantly increased al the studied parameters i.e. weight of 100 seeds, weight of pods, yield of straw and seeds, shelling%, uptake of macro (N, P and K) and micronutrients (Fe, Mn and Zn) by straw and seeds of groundnut.

Therefore, the objective of the present investigation was to evaluate the performance of two peanut genotypes and their productivity under newly reclaimed sandy soil and determine the effect of applied N, P and K on peanut yield, quality and N, P and K concentration and uptake in Sandy soils in terms of growth characters, yield and its components.

MATERIALS AND METHODS

Two field experiments were carried out at Ismailia Agricultural Research Station during 2011 and 2012 summer growing seasons to investigate the effects of applied N, P and K on peanut yield and quality in Sandy soils. The soil of experimental site is sandy calcareous with pH (7.8), available N (18.2 pp m), available P (2.2 ppm), available K (71.90 ppm), E.C. (0.14 dSm^{-1}) and O.M. % (0.46 %). The experimental design was split plot in a randomized complete block with four replicates was used where genotypes were arranged in the main plots and fertilizers rate were devoted to the sub-plots. The two peanut genotypes i.e., Gregory (Spreading) and Ismailia-1 (Semi-Spreading) types were used to increased doses of N,P and K fertilization under sandy soil conditions and the effect of fertilizers on yield and seed quality were studied.
The mechanical and chemical analysis of the experimental soil are presented in Table (1).

Table (1). Mechanical and chemical analysis of soil before conducting the experiment.

Chemical analysis		Mechanical analysis	
Coarse sand%	69.58	pH (1:2.5 suspension)	7.8
Fine sand%	23.51	EC dSm^{-1} in the soil water extract (1:5)	0.137
Silt%	3.01	O.M%	0.461
Clay%	3.90	Available N (ppm)	18.198
Soil texture : sandy		Available p (ppm)	2 .189
		Available K (ppm)	71.897

Fertilization treatments were applied as shown below and other cultural practices were carried out as recommended.

No.	N	P_2O_5	K_2O	No.	N	P_2O_5	K_2O
1-	30	30	24	7-	45	45	24
2-	30	30	48	8-	45	45	48
3-	30	45	24	9-	60	30	24
4-	30	45	48	10-	60	30	48
5-	45	30	24	11-	60	45	24
6-	45	30	48	12-	60	45	48

Studied characters:

The experimental unit area was 10.5 m^2 and contained 5 ridges; 60 cm apart and 3.5 m long. Seeds were inoculated with the specific *Rhizobium japonicum* strain before sowing. Seeds were sown by hand on one side of the ridges (3-4 seed in each hill) on May 11 and 25 in 2011 and 2012 seasons, respectively. After two weeks of germination, seedlings were thinned to 2 plants $hill^{-1}$. The recommended rate 500 kg gypsum $fed.^{-1}$ was added during soil preparation. Phosphorus fertilizer in the form of monocalcium super phosphate (15.5% P_2O_5) was added at soil preparation and nitrogen fertilizer

was added in the form ammonium nitrate (33.5% kg N fed.$^{-1}$), and potassium fertilizer in the form of potassium sulfate (48 %K_20). Each nitrogen and potassium fertilizer was solitude in two equal doses. The first one was added after 15 while the second one was added at 30 day after sowing. All recommended agricultural practices were adopted throughout both growth seasons. At harvest, a sample of five guarded plants was taken randomly from each sub-plot to determine plant height, number of branches plant^{-1} and number of pods plant^{-1}. In addition, after pod drying the following characters were estimated; pod weightplant^{-1}, pod yield fed.$^{-1}$, 100-pod weight, 100-seed weight and shelling (estimated from 100 random pods).

Studied characters:

a- Vegetative characters:

1- Plant height (cm). 2- No. of branches plant^{-1}.

b- Yield characters:

1- No. of pods plant^{-1}. 2- Pod weight plant^{-1} (g)

3- Seed weight plant^{-1} (g) 4- Pod yield fed.$^{-1}$ (kg)

C- pod and seed characters:

1- 100- Pod weight (g). 2- 100- seed weight (g).

3- Shelling%

After peanut harvest, N, P and K % were determined in peanut seed at harvest, according to the methods described by Jackson (1967). N, P and K uptake, at yield as mg plant^{-1} in peanut seed were estimated:

$$Nutrient\ element\ uptake = \frac{Nutrient\ element\%\ in\ seed \times Seed\ Weight\ per\ plant}{100}$$

Statistical analysis:

All the obtained data were subjected to analysis of variance according to method described by Snedecor and Cochran (1982). The least significant difference (LSD) at 5% level of significance to compare differences among means was used.

Correlation analysis:

Simple correlation coefficient was computed among seed weight plant^{-1} and its related characters as suggested by SAS program (1985).

RESULTS AND DISCUSSION

I-Vegetative characters:

1- Plant height:

The effect of genotypes on plant height (cm) was significant in both seasons. The highest values of plant height produce with Ismailia-1 (30.14 cm) compared to Gregory (25.59cm). With regard to fertilization treatments it had a significant gradual increase on plant height by increasing the rates of fertilizer up to (60+45+24kgNPK fed.$^{-1}$) in 2011 and to (60+30 +24 and 60+45+48kg NPK fed.$^{-1}$) in 2012 season. The interaction among genotypes, nitrogen, phosphorus and potassium fertilization had a significant or significantly effect in the summer growing seasons 2011 and 2012. The highest plants (31cm) were recorded by increasing rate of fertilizer up to

(60+45+24kgNPK fed.$^{-1}$) in 2011 and (29.63cm) to (60+30+24kg NPK fed.$^{-1}$) and (60+45+48kg NPK fed.$^{-1}$) in 2012 season.

2-No. of branches plant^{-1}:

Genotypes Gregory had higher number of branches plant^{-1} in both seasons, compared to Ismailia-1 (5.50 and 4.47 for both genotypes, respectively). The increasing in number of branches plant^{-1} with increasing rate of fertilizer applied up to (60+30+48kg NPK fed.$^{-1}$) in 2011 and up to (60+45+24/kg NPK fed.$^{-1}$) in 2012 season. Significantly effects were recorded on number of branches plant^{-1} in both seasons and combined by interaction among genotypes, nitrogen, phosphorus and potassium fertilization .The maximum number of branches plant^{-1} were recorded (6.88) by genotypes x fertilization in both seasons by increasing rates of fertilizer up to (60+30+48 kg NPK fed.$^{-1}$) and to (60+45+48 kg NPK fed.$^{-1}$) in 2011 and 2012 seasons with (6.44) in the combined. This means that the behavior of the varieties affected by phosphorus application and environmental effect. As well as the number of branches plant^{-1} depends on the plant height in order to give the more branches.

II- Yield characters:

1- No. of pods plant^{-1}:

Studied genotypes differed significant effect in number of pods plant^{-1} in 2011, 2012 seasons, the highest values of number of pods plant^{-1} produced with Ismailia-1 genotype (26.31). The effect of fertilization treatments was significantly no number of podsplant^{-1}, which increased gradually by increasing fertilizer dose up to (60+45+48kg NPK fed.$^{-1}$) in both seasons. The data in Table (2) showed that number of pods plant^{-1} was significantly affected by genotypes with fertilization interaction recording 30.50, 32.00 and 31.25 in 2011, 2012 seasons and combined, respectively, which increased gradually by increasing fertilizer rate up to(60+45+48kg NPK fed.$^{-1}$) in both seasons and combined. These results are in the same line with those obtained by Amgadi *et al* (1989), EL-Sayed and yousef (2003) and Ismail and Abdel-Momen (2007) where significant interaction between cultivars and fertilization treatments was reported.

2- Pod weight plant^{-1} (g):

Data in Table (2) showed that the genotype Ismailia-1 had the higher values of pod weight plant^{-1} (41.14g) compared to Gregory (41.0 g). An increase in pod weight plant^{-1} was showed in both seasons by increasing dose of fertilizer applied up to (60+45+24kg NPK fed.$^{-1}$) in 2011 and (60+45+48Kg NPK fed.$^{-1}$) in 2012 season. The maximum value for pods weight plant^{-1} was recorded (47.25), (49.25) and (49.25) by genotypes x fertilization interaction in both seasons and combined , however the pods yield was surpassed with (60+45+24 kg NPK fed.$^{-1}$) in 2011and (60+45+48 kg NPK fed.$^{-1}$) in 2012 and combined interactions, respectively. Similar results were obtained by Ismail and Abdel-Momen (2007). With reference to interaction between cultivars and fertilization on pods weightplant^{-1} it was significantly in both seasons.

Table (2): Averages of plant height, No. of branches plant^{-1}, No. of podsplant^{-1}, Pod weight plant^{-1}(g), and Seed weight plant^{-1} as affected by cultivars and fertilizations(N,P and K levels) in 2011and 2012 seasons and their combined.

Characters / Treatments	Vegetative characters						Yield characters								
	Plant height(cm)			No. of branches plant^{-1}			No. of pods plant^{-1}			Pod weight plant^{-1}(g)			Seed weight plant^{-1}		
	2011	2012	Comb.	2011	2012	Comb.	2011	2012	Comb.	2011	2012	Comb.	2011	2012	Comb.
cultivars															
Gregory	25.58	25.60	25.59	5.67	5.33	5.50	24.39	25.21	24.80	38.39	39.31	38.85	21.58	22.37	21.93
Ismailia 1	30.44	29.83	30.14	4.63	4.31	4.47	25.89	26.73	26.31	41.14	41.00	41.08	23.73	23.48	23.61
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD 5%	2.82	2.00	1.08	0.49	0.64	5.25	0.72	0.87	0.35	0.79	0.36	0.37	0.45	0.42	0.19
Fertilization:															
30-30-24 Kg NPK fed.$^{-1}$	25.88	24.75	25.32	3.63	3.88	3.76	20.38	20.75	20.75	31.36	31.00	31.32	16.40	15.98	16.19
30-30-45 Kg NPK fed.$^{-1}$	25.50	24.50	25.00	3.88	3.38	3.63	20.38	21.63	21.01	34.00	33.13	33.57	17.93	17.41	17.67
30-45-24 Kg NPK fed^{-1}	25.75	25.50	25.63	4.13	4.00	4.07	21.50	21.00	21.25	33.00	33.63	33.32	17.48	17.91	17.69
30-45-48 Kg NPK fed.$^{-1}$	26.13	27.13	26.63	4.50	4.38	4.44	21.38	21.88	21.63	34.13	34.38	34.26	18.23	18.29	18.26
45-30-24 Kg NPK fed.$^{-1}$	27.25	28.25	27.75	4.63	4.38	4.51	23.75	25.25	24.50	38.50	39.38	38.94	21.68	22.22	21.95
45-30-48 Kg NPK fed.$^{-1}$	28.25	27..38	27.82	5.00	4.63	4.82	24.64	25.88	25.25	39.25	39.63	39.44	21.38	22.39	21.89
45-45-24 Kg NPK fed.$^{-1}$	28.00	29.13	28.57	5.25	4.25	4.75	25.00	26.38	25.69	40.38	39.88	40.13	23.01	22.80	22.91
45-45-48 Kg NPK fed.$^{-1}$	27.38	28.25	27.82	5.00	4.38	4.69	25.50	26.50	26.00	40.88	41.38	41.13	23.55	24.10	23.79
60-30-24 Kg NPK fed.$^{-1}$	30.13	29.63	29.88	6.25	5.88	6.07	29.25	29.50	29.38	45.38	46.13	45.76	27.10	27.46	27.28
60-30-48 Kg NPK fed.$^{-1}$	30.88	29.50	30.19	6.88	6.00	6.44	29.63	30.25	29.94	46.25	47.13	46.69	27.10	27.46	28.06
60-45-24 Kg NPK fed.$^{-1}$	31.00	29.00	30..00	6.13	6.38	6.26	29.88	30.63	30.26	47.25	47.00	47.13	28.25	28.29	28.27
60-45-48 Kg NPK fed.$^{-1}$	30.00	29.63	29.82	6.50	6.88	6.44	30.50	32.00	31.25	46.63	49.25	47.94	28.28	29.96	29.12
F-test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD 5%	1.78	1.75	1.23	0.40	0.45	0.30	1.29	0.50	0.68	1.61	0.16	0.98	6.65	0.78	0.50
V×F	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

3- Seed weight plant^{-1} (g):

Data in Table (2) revealed that seed weight/ plant was significantly affected by genotypes in both seasons. Ismailia $^{-1}$ gave higher values of seed weight plant^{-1} (23.73g) in 2011 compared to Gregory (22.37 g) in 2012. Fertilization treatments significantly affected this character. Increasing rate of fertilizer up to (60+45+48 kg NPK fed.$^{-1}$) significantly increased seed weight plant^{-1} in both seasons. A significantly interaction among Genotypes x fertilization rate on this character was obtained in 2011 season and the combined. The maximum value for seed weight/ plant (28.28 g), (29.96) in both seasons was recorded by increasing rate of fertilizer up to (60+45+48 kg NPK fed.$^{-1}$) interaction in both seasons respectively .These results are in harmony with those obtained by Yakadri *et al.* (1992) and Ismail and Abdel-Momen (2007).

4- Pod yield fed.$^{-1}$ (kg)

Data in Table 3 showed that the genotypes have significant differences in pod yield fed.$^{-1}$ in both seasons. Gregory yielded more than Ismailia-1 higher. However, Gregory genotype recorded (1417.44) compared to (1335.48) Ismailia-1 genotype in 2012 season. Fertilization treatments differed significant in their effects on pod yield fed.$^{-1}$. The increase in yield by increase fertilizer dose was gradually and consistent up to (60+45+48 kg NPK fed.$^{-1}$), indicating the response of both genotypes to increasing fertilization up to higher level. These results are in agreement with those obtained by Patra *et al* (1995), Megawer and Solimam (2001), EL-Sayed and Yousef (2003) and Ismail and Abdel-Momen (2007). Genotypes x Fertilization interactions were significant in both seasons. The maximum values for pods where recording (1923.13) & (1979.25) in 2011 and 2012 respectively, by increasing rate of fertilizer up to (60+45+48 kg NPK fed.$^{-1}$) interaction in both seasons. These results are in agreement with those obtained by Patra *et al* (1995), Megawer and Solimam (2001), EL-Sayed and yousef (2003) and Ismail and Abdel-Momen (2007). A significant interaction between cultivars and fertilizer dose was reported in both seasons.

III-pod and seed characters:

1- 100-pod weight (g):

Data in Table (3) showed significant increase in 100-pod weight for genotypes in both seasons. Gregory was recorded (158.25g) higher 100-pod weight compared to Ismailia-1 in 2011 season. However, Ismailia-1 genotype was higher 100-pod weight in 2012 season compared to Gregory in 2012 season. Fertilization treatment also was significantly in their effects on 100-pod weight, indicating a slight increase in these characters by increasing fertilizers up to (60+45+48kg NPK fed.$^{-1}$). The maximum value for 100-pod weight in both seasons was realized with genotypes x fertilization interactions wherever, increasing rate of fertilizer up to (60+45+48 kg NPK fed.$^{-1}$) interaction gave the higher value for pods yield fed.$^{-1}$both season. These results agree with those of Megawer and Solimam (2003) and Ismail and Abdel-Momen (2007). Results obtained showed also a significantly interaction between cultivars and fertilization in both seasons.

2- 100-seed weight (g).

Data in Table (3) revealed a significant effect on 100-seed weight in 2011season, but, non- significant in 2012season. However, Ismailia-1 genotype gave the higher values of 100-seed weight compared to Gregory genotype recoding (73.92 and 74.31g) in 2011 and 2012 seasons, respectively. Fertilization treatments showed a gradual increase in 100- seed weight by increasing fertilization rates up to (60+45+48kg NPK fed.$^{-1}$) in both seasons. The maximum 100-seed weight was recorded (83.75 and 85.25g) by increasing fertilization rates up to (60+30+48Kg NPK fed.$^{-1}$ and 60+45+48kg NPK fed.$^{-1}$) in 2012. The interaction among genotypes x fertilization (Table 3) showed that100-seed weight was affected significantly by interaction between genotypes with fertilization in both seasons. The maximum values 0f 100-seed weight were recorded (83.75 and 85.25g) by (60+30+48 Kg NPK fed.$^{-1}$ and 60+45+48kg NPK fed.$^{-1}$) in the second season.

These results stand in accordance with those obtained by Megawer and Soliman (2003) and Ismail and Abdel- Momen (2007), however, doses of fertilizers applied differed significantly in their effect on seed weight. A significant interaction between genotypes and fertilization treatments was reported with regard to 100-seed weight.

Table (3): Averages of pod yield fed.$^{-1}$,100-pod weight, 100- seed weight and shelling % as affected by cultivars and fertilizations (N, P and K levels) in 2011 and 2012 seasons and their combined.

Characters / Treatments	Yield characters						Pod and seed characters					
	pod yield fed.$^{-1}$ (kg)			100-pod weight (g)			100-seed weight (g)			Shelling %		
	2011	2012	Comb.	2011	2012	Comb.	2011	2012	Comb.	2011	2012	Comb.
Cultivars												
Gregory	1323.44	1417.44	1370.65	158.25	156.81	157.53	72.94	73.89	73.42	56.00	56.00	56.33
Ismailia 1	1335.48	1335.48	1361.22	157.83	158.39	158.11	73.92	74.31	74.12	57.04	57.04	56.81
F-test	*	*	*	*	*	*	*	ns	*	*	*	*
LSD 5%	13.00	5.50	4.30	0.32	1.16	0.68	0.54	-	0.31	0.51	0.51	0.40
Fertilization:												
30-30-24 Kg NPK fed.$^{-1}$	715.25	789.00	752013	146.50	145.00	145.75	63.63	63.83	63.51	52.00	52.00	51.75
30-30-48 Kg NPK fed.$^{-1}$	761.88	868.88	815.38	148.00	148.38	148.19	64.88	63.88	64.38	52.75	52.75	52.63
30-45-24 Kg NPK fed.$^{-1}$	921.38	929.00	925.19	147.63	147.13	147.38	64.75	65.75	65.25	53.00	53.00	53.13
30-45-48 Kg NPK fed.$^{-1}$	971.88	1018.63	995.26	151.13	149.00	150.07	66.13	66.00	66.07	53.50	53.50	53.38
45-30-24 Kg NPK fed.$^{-1}$	1189.64	1287.75	1238.69	157.50	158.13	157.82	72.50	72.38	72.44	56.25	56.25	55.82
45-30-48 Kg NPK fed.$^{-1}$	1308.00	1421.75	1364.88	160.00	159.50	159.75	73.38	74.00	73.69	56.38	56.38	56.44
45-45-24 Kg NPK fed.$^{-1}$	1411.38	1497.13	1454.51	159.38	160.00	159.69	73.13	74.13	73.63	56.75	56.75	57.00
45-45-48 Kg NPK fed.$^{-1}$	1461.88	1549.13	1505.51	161.00	161.00	161.00	75.88	74.75	74.82	57.50	57.50	57.75
60-30-24 Kg NPK fed.$^{-1}$	1669.75	1753.00	1711.38	165.00	164.00	164.50	81.13	82.38	81.76	59.75	59.75	59.57
60-30-48 Kg NPK fed.$^{-1}$	1758.88	1826.65	1792.76	166.38	164.63	165.51	81.75	83.75	82.75	60.00	60.00	60.00
60-45-24 Kg NPK fed.$^{-1}$	1860.50	1908.25	1884.38	165.88	166.50	166.19	81.75	83.64	82.69	59.88	59.88	60.69
60-45-48 Kg NPK fed.$^{-1}$	1923.13	1979.25	1951.19	168.13	168.00	168.07	83.25	85.25	84.25	60.50	60.50	60.69
F-test	*	*	*	*	*	*	*	*	*	*	*	*
LSD 5%	77.00	69.00	51.00	1.04	0.98	0.70	0.49	0.72	0.39	0.80	0.80	0.97
Interaction(V×N)	*	*	*	*	*	**	*	*	*	*	*	*

3- Shelling%

Results in Table 3 showed significantly effects in shelling % between genotypes in both seasons, but it was significant only with the combined. However, Ismailia-1 genotype gave the higher values of shelling % recording (57.04 %) in the two seasons compared to Gregory genotype (56.00g). With regard to fertilization treatments, the same trend was also reported. Results showed an increase in shelling % which was increased by increasing fertilization rates up to (60+45+48kg NPK fed.$^{-1}$) in 2011 and to (60+45+24kg NPK fed.$^{-1}$) in 2012 season. The data in Table 3 revealed significantly by genotypes × fertilization interaction effect in both seasons. The higher values

of shelling % were recording (60.50 %) by (60+45+48kg NPK fed.$^{-1}$) in the two seasons. Generally, Ismailia-1 genotype as well as (60+45+48kgNPK fed.$^{-1}$) gave the highest values of most studied treats in the both seasons.

Yield analysis:

Correlation results:

Values of simple correlation coefficient (r) for the inter relationships of pod yield (kg fed.$^{-1}$), plant height (cm), number of branches plant^{-1}, number of pods plant^{-1}, pod weight plant^{-1} (g), seed weight plant^{-1} (g),100-pod weight (g), 100-seedweight (g) and shelling percentage are given in Table (4). Positive and significant correlation coefficients (r) among pod yield fed.$^{-1}$ (kg) for all studied characters. Also positive and significant relationship was found between plant height number of podsplant^{-1}, pod weightplant^{-1}, 100-pod weight, 100-seedweight and shelling % while it was insignificant for number of branches plant^{-1} and seed weight plant^{-1}. Also, positive and significant relationship between no .of branches plant^{-1} and all studied characters except pod weight plant^{-1}, which was insignificant. Positive and significant relationship between no. of pods plant^{-1} and all studied characters and between pod weightplant^{-1} and all studied characters between seed weight plant^{-1}, 100-pod weight, 100-seed weight and shelling, also, positive and significant correlation was found between 100-pod weight and 100-seed and shelling %. Also, positive and significant relationship was found between 100-seed weight and shelling %. Similar results were obtained by Gomaa *et al* (1995), Ali and mowafy (2003) and Ismail and Abdel-Momen (2007). It could be noted that the rest of characters correlated positively with each other indicating that these characters should be considered when the agronomist selects the optimum N, P and K fertilizers for obtaining higher pod yield.

Table (4): Simple correlation coefficients among pod yield (kg fed.$^{-1}$) and its related characters in peanut genotypes (over two seasons).

Characters	1	2	3	4	5	6	7	8
1- Plant height	-	0.771**	0.962**	0.965**	0.966**	0.973**	0.980**	0.959**
2-N. of branchesplant^{-1}		-	0.725**	0.728**	0.731**	0.618**	0.641**	0.662**
3-N.of pod plant^{-1}			-	0.686**	0.661**	0.699**	0.743**	0.646**
4- Pod weight plant^{-1}				-	0.687**	0.952**	0.975**	0.943**
5- Seed weight plant^{-1}.					-	0.963**	0.979**	0.960**
6- 100-pod weight.						-	0.999**	0.979**
7^{-} 100seedweigh							-	0.966**
8- Shelling %								-

***and**: Significant and significantly at 0.05 and 0.01 probability levels, respectively.**

N, P and K concentration (%) and its uptake (mg plant^{-1}) in Peanut seed:

Data in Table 5 indicated that the peanut varieties were significantly affected in N % and K % in the 1st season and insignificant in the 2nd season, but P % was significantly in the both season. As well, data in Table 6 showed that the genotypes were significantly in N-uptake and P-uptake in 2012 and insignificantly in 2011 and K-uptake in both seasons. Also, data in Table 5 indicated that the highest values of N, P concentration in both season were

obtained with Gregory, but the highest values K% were obtained with Gregory in the 1st season and with Ismailia-1 in the 2nd season. So, N, P and K-uptake for Ismailia-1 were the highest values in both seasons (Table 6).

Table (5): Averages N, P and K % in seeds as affected by cultivars and fertilizations (N, P and K levels) in 2011 and 2012 seasons

Characters / Treatment	N-uptake		P-uptake		K-uptake	
	2011	2012	2011	2012	2011	2012
Varieties						
Gregory	1.063	1.014	0.111	0.106	0.126	0.120
Ismailia 1	0.968	0.974	0.102	0.102	0.121	0.122
F. test	*	NS	*	*	*	NS
LSD 5%	0.089	-	0.074	0.03	0.042	-
Fertilization:						
30+30+24 Kg NPK fed.$^{-1}$	0.713	0.725	0.087	0.088	0.111	0.113
30+30+48 Kg NPK fed.$^{-1}$	1.045	1.061	0.092	0.092	0.112	0.115
30+45+24 Kg NPK fed.$^{-1}$	1.143	1.107	0.111	0.107	0.125	0.116
30+45+48 Kg NPK fed.$^{-1}$	1.181	1.167	0.144	0.142	0.127	0.124
45+30+24 Kg NPK fed.$^{-1}$	1.101	1.071	0.091	0.088	0.114	0.109
45+30+48 Kg NPK fed.$^{-1}$	1.127	1.071	0.099	0.093	0.134	0.127
45+45+24 Kg NPK fed.$^{-1}$	1.057	1.059	0.106	0.105	0.126	0.126
45+45+48 Kg NPK fed.$^{-1}$	1.107	1.074	0.117	0.114	0.124	0.120
60+30+24 Kg NPK fed.$^{-1}$	1.185	1.170	0.075	0.073	0.114	0.112
60+30+48 Kg NPK fed.$^{-1}$	1.199	1.182	0.082	0.080	0.128	0.125
60+45+24 Kg NPK fed.$^{-1}$	1.157	1.152	0.090	0.089	0.117	0.116
60+45+48 Kg NPK fed.$^{-1}$	1.163	1.089	0.113	0.106	0.132	0.124
F. test	*	*	*	*	ns	ns
LSD 5%	0.112	0.231	0.041	0.035	-	-
V*F	NS	NS	NS	NS	NS	NS

Table (6): Averages N, P and K uptake (mg plant^{-1}) in seeds as affected by cultivars and fertilizations (N, P and K levels) in 2011 and 2012 seasons.

Characters	N-uptake		P-uptake		K-uptake	
Treatment	**2011**	**2012**	**2011**	**2012**	**2011**	**2012**
Varieties						
Gregory	229.5	226.8	23.99	23.69	27.19	26.86
Ismailia 1	229.8	228.6	24.17	24.03	28.80	28.61
F. test	NS	*	NS	*	NS	NS
LSD 5%	-	0.120	-	0.324	-	-
Fertilization:						
30+30+24 Kg NPK fed.$^{-1}$	116.9	115.8	14.21	14.07	18.22	18.03
30+30+48 Kg NPK fed.$^{-1}$	187.4	184.7	16.43	15.94	20.13	19.97
30+45+24 Kg NPK fed.$^{-1}$	199.8	198.3	19.36	19.08	21.88	20.77
30+45+48 Kg NPK fed.$^{-1}$	215.3	213.5	26.20	26.00	23.08	22.73
45+30+24 Kg NPK fed.$^{-1}$	238.6	238.0	19.74	19.57	24.82	24.16
45+30+48 Kg NPK fed.$^{-1}$	240.9	239.9	21.18	20.74	28.63	28.50
45+45+24 Kg NPK fed.$^{-1}$	243.2	241.4	24.37	23.92	28.93	28.78
45+45+48 Kg NPK fed.$^{-1}$	260.7	258.9	27.56	27.38	29.19	28.98
60+30+24 Kg NPK fed.$^{-1}$	321.1	321.3	20.43	20.09	30.96	30.82
60+30+48 Kg NPK fed.$^{-1}$	325.0	324.7	22.34	21.91	34.64	34.19
60+45+24 Kg NPK fed.$^{-1}$	326.9	326.0	25.35	25.24	33.03	32.80
60+45+48 Kg NPK fed.$^{-1}$	328.8	326.3	31.87	31.63	37.32	37.03
F. test	*	*	*	*	*	*
LSD 5%	0.352	0.349	0.029	0.030	0.031	0.032
V*F	NS	NS	NS	NS	NS	NS

The effect of mineral NPK fertilization on concentration of N, P and K in peanut seed was showed in Table 5, this effect was significantly in N% and P% in the both seasons, but it was insignificantly in K% in the both seasons. The highest values of N% were obtained with (60-30-48 Kg NPK fed.$^{-1}$), P% with (30-45-48 Kg NPK fed.$^{-1}$) and K% with (45-30-48 Kg NPK fed.$^{-1}$). Moreover, Data presented in Table 6 showed that N, p and K-uptake significantly increase in peanut seed in both 2011 and 2012 seasons by mineral N-P-K fertilizations. Also, the highest mean value of N, P and K-uptake was obtained with 60+45+48 kg NPK fed.$^{-1}$ as mineral fertilizers in both seasons and the sequent highest mean values of N-uptake were recorded with (60-45-24, 60+30+48 and 60+30+24 kg NPK fed.$^{-1}$, respectively), (45+45+48, 30+45+48 and 60+45+24 kg NPK fed.$^{-1}$ respectively) for P-uptake and (60+30+48, 45+45+48 and 45+30+48 kg NPK fed.$^{-1}$ respectively) for K-uptake in both seasons. Also, data in Table 5 and 6 showed that interaction effect between Peanut varieties and mineral N-P-K fertilization treatments was insignificant on N, P and K concentration and its uptake in both seasons. The similar results were obtained by El-Habbasha *et al.* (2005) and Ibrahim and Eleiwa (2008).

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تأثير التسميد الأزوتي والفوسفاتي والبوتاسي على المحصول وصفات الجودة وامتصاص العناصر للفول السوداني في الأراضي الرملية.

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أقيمت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بالإسماعيلية خلال صيفي 2011و2012م لدراسة تأثير التسميد النيتروجيني والفوسفاتي والبوتاسي على صفات المحصول ومكوناته وكذلك صفة جودة القرون والبذورلتركيبين وراثيين من الفول السوداني هما (اسماعلية 1,جريجورى).

ويمكن تلخيص أهم النتائج فيما يلي:

1- تفوق التركيب الوراثي إسماعيلية 1 معنويا على التركيب الوراثي جريجورى في الصفات الخضرية والمحصولية وصفات جودة القرون والبذور ونسبة التصافى فيما عدا صفة عدد الافرع / نبات ومحصول القرون (كجم/فدان).

2- أدت زيادة معدلات التسميد من النيتروجيني والفوسفاتي والبوتاسي من (30-30-24) الى (60-45-48 كجم /فدان) الى زيادة معنوية في صفات ارتفاع النبات، عددالافرع، عددالقرون،وزنالقرون، وزنالبذور للنبات، محصول القرون /فدان وكذلك زيادة وزن 100قرن، وزن 100 بذرة ونسبة التصافي وامتصاص النيتروجين والفوسفور والبوتاسيوم.

3- أظهرت النتائج أيضا أن التفاعل بين التراكيب الوراثية ومعدلات التسميد النيتروجيني والفوسفاتي والبوتاسي كانت معنوية أو عالية المعنوية لمعظم الصفات تحت الدراسة في كلا الموسمين.

4- أوضحت نتائج تحليل الارتباط وجود ارتباط موجب ومعنوي بين محصول القرون / فدان وكل الصفات تحت الدراسة.

5- أعطي التركيب الوراثي إسماعيلية 1 مع معدل التسميد (60-45-48 كجم /فدان) من النيتروجين والفوسفور والبوتاسيوم أعلي القيم لمعظم الصفات تحت الدراسة في كلا الموسمين.