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PERFORMANCE OF TWO PEANUT CULTIVARS AND THEIR RESPONSE TO NPK FERTILIZATION IN NEWLY RECLAIMED LOAMY SAND SOIL.

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ABSTRACT

Two field experiments were carried out during 1999 and 2000 summer season at the experimental Farm, Fac. of Agric. at Fayoum (newly reclaimed sandy soil), to study the performance and responses of two peanut cultivars (Giza 4 &Giza 5) to different combination level of NPK fertilizer T_1 (15N+20P+25K), T_2(30N+20P+50K), T_3 (15N+30P+25K), T_4 (30N+30P+50K), T_5 (15N+40P+25K), and T_6 (30N+40P+ 50K) were tested.

Result revealed significant differences between cultivars concerning the majority of growth, yield, yield components as well as seed oil and protein contents. This keep true also for the effect of NPK fertilizer treatments as well as the interactions between cultivars and fertilization treatments. The two tested cultivars showed different behaviour during their vegetative and reproductive growth periods. Except for plant height at 75 and 90 days age and seed protein content in the both seasons, all the character averages were in favour of V_2 (Giza 5).

T_3 (15 N + 30 P + 25 K) and/or T_4 (30 N + 30 P + 50 K) were the most suitable nutrient combinations for improving growth and yield characters of peanut grown in such soil. The highest yield (2.7 and 3.1 t/fad. In 1st and 2nd season, respectively) with acceptable oil and protein contents were obtained from V_2 (Giza5) when fertilized with T_4 (30N + 30P + 50K) treatment. Finally, the data indicated that growing peanut in such newly reclaimed soil under balanced nutrition is profitable.

INTRODUCTION

The importance of peanut (*Arachis hypogaea,* L.) as one of the leguminous crops, is due to the high nutritive value of its seeds which considered rich in protein and fats in addition to other vital components. Therefore, it is an important source of edible oil and protein. Peanut protein may be supplement other proteins deficient in lysine such as cereals, and hence their usage together is fruitful in creating human–food balance especially in developing countries. Moreover, the peanut green leafy organs (contain more than 10% protein) is another advantage characterized the crop as a good fodder for livestock.

In addition, the crop has a good ability for growing in lightly soil, and thrives in improving the characteristics of the newly reclaimed sandy soils which commonly suffer from some constraints such as poor physical properties and nutrients deficiency. In Egypt, during the last two decades, land reclamation is a must. Several newly reclaimed areas were performed at different governorates, including El-Fayoum, which has about 15% of its acreage as newly reclaimed sandy soils adjacent to the desert. These areas should be cultivated with appropriate crops enable to overcome its poor features and improve its productivity. In this regard, peanut is a preferable choice. So, many research attempts were carried out to manage the peanut crop and to raise its yield quantity and quality in such soil types under different agricultural practices including fertilization with the main macro-nutrients N, P and/or K separately or in combinations.

Phosphorus (P) and potassium (K) fertilization had intensive work compared to those conducted on nitrogen (N). This might be attributed to the idea that adequate supplement of P is important for increasing nodule formation and increased N fixed by legume plants (Robson,1983). Moreover, K has a beneficial effect on N fixation and transformation of photosynthates from the leaves to the root nodules (Haghaparast-Tanha,1975). So, relatively little information are available on N effect on peanut crop. Jakbro (1984) as well as El-Seesy and Ashoub (1994) suggested that N application enhanced growth and yield characters of peanut. Abdel-Halem *et al.* (1988) reported that 60 kg N/faddan was adequate dose for producing high yield in sandy soil.

Phosphorus fertilization was investigated by several workers and recommended varied doses of P_2O_5 kg/ha for raising yield and its attributes, i.e. 25 kg (Bhatol *et al.*, 1994); 33 kg (Kumar and Ray Chudhuri, 1997); 40kg (Dwivedi and Gautam, 1992); 50 kg (Patel *et al.*, 1995); 60 kg (Yakadri *et al.*, 1992) and about 114 kg (El-Far and Ramadan, 2000). Also, different potassium fertilization doses (expressed as kg K_2O/ha) adequate for best growth and yield were detected by various authors, i.e. 30 (Ghatak *et al.*, 1997); 50 (Patra *et al.,* 1995), 60 (Timmegowdd, 1995), (Gabr, 1998) and (Abdel Halem *et al.*, 1988). On the other hand, Nour El-Din *et al.*, (1986) reported that P as well as K had no effects on growth and yield of peanut grown in soil containing high nutrient contents. Concerning fertilization with combination of these nutrient, proper different levels of N and P (expressed as kg/ha of N and P_2O_5, respectively) were detected by (Lal and Saran, 1988) 20 & 40; (Agasimani and Hosmani, 1989) 50&100; (Patil, 1992) 40&60 and (Patel *et al.,* 1994) 25&50. Nasr-Alla *et al.* (1998) reported that increasing the rate of PK individually or in combination increased the crop growth and yield characters. However, Channawar *et al.,* (1995) found insignificant effect of NP on peanut yield. NPK fertilization combination at the rate (N, P_2O_5 and K_2O, respectively, kg/ha) of 40, 80 and 40 (Angadi *et al.*, 1989); 40, 80 and 30 (Barik *et al.,* 1994); and 20, 60 and 40 (Purushotham and Hosmani, 1994) were the best for producing the highest peanut yield.

It is a fundamental principle that raising crop yield requires both genetic and agricultural improvement. The capacity of yield potential will be enlarged by enhanced agronomic inputs. So, under the newly reclaimed soil which mostly deficient in one or more of the essential nutrients, it should be search for the adequate perfect nutrients supplement in balanced manner. Therefore, the objective of the present investigation were; to evaluate the performance of two peanut cultivars under newly reclaimed loam sandy soil and determine their response to different combination of NPK fertilization in term of some growth characters, yields and its components.

MATERIALS AND METHODS

Two summer field experiments were carried out at the experimental Farm at Demo, Fayoum, Fac. of Agric., Cairo Univ., during the two consecutive seasons, 1999 and 2000, to investigate the response of some vegetative growth characters, yield and yield components of two peanut cultivars to nitrogen, phosphorus and potassium fertilization. The soil of the experimental sites was loam sandy in texture. Average of some physical and chemical proprieties of the experimental sites shown in Table1.

The experimental design was split-plot in randomized complete block design with four replicates Sub-plot area was 10.5m^2 contains 5 rows, with 3.5m long and 60 cm apart. Plots were separated from each other by a one meter border strip running lengthwise. The experiment was surrounded by a 2m as wide belt protecting. Peanut cultivars Giza 4 (V_1) and Giza 5 (V_2) were assigned to the main plots and NPK combinations: T_1 (15N+20P+25K), T_2 (30N+20P+50K), T_3 (15N+30P+25K), T_4 (30N+30P+50K), T_5 (15N+40P+25K), and T_6 (30N+40P+50K) kg N, P_2O_5 and K_2O/fad, respectively, were placed in sub-plots. Amonioum sulfate (20.5% N), supermonophosphate (15.5% P_2O_5) and potassium sulfate (50% K_2O) were added in two equal doses, immediately before sowing and 21 days latter. In both seasons, the preceding crop was canola. Seeds were sown on May 10 in both seasons in hills spaced 20 cm apart within the rows. Each plot was irrigated separately. All the other recommended agricultural practices were adopted throughout both growth seasons. At 60, 75 and 90 days plant ages, five plants were taken randomly from each sub-plot to measure some growth characters, i.e., plant height (cm), number of primary branches/plant, number of secondary branches/plant, dry matter weight/plant (g).

At harvest time, random sample of 10 guarded plants was taken from each sub-plot in the four replications to determine the plant characters averages, i.e. plant height, number of primary branches/plant, number of secondary branches, numbers of pods/plant, seeds as well as weights of pods and seeds/plant. After pod drying, pods yield (t/fad) and 100-pods weight were determined using the inner two rows/plot.

In addition, samples of seeds obtained from 100-pods collected randomly from each sub-plot in four replicates were used to determine: (1) total nitrogen by using micro-Kjeldahl method, as described by A.O.A.C. (1980), the protein content in seeds was calculated by multiplying the total nitrogen percentage by a factor of 6.25. (2) Seed oil percentage was determined by NMR methods as described by Granhund and Zimmerman (1975). Analysis of variance was done according to Gomez and Gomez (1984). The least significant difference (LSD) test at 5% level was used for assigning differences among means.

Table 1: Physical and chemical analysis of a representative soil sample from the experimental sites of both seasons.

Constituents	Soil depth (cm)		
	0-20	20-40	40-60
Physical analysis			
Sand %	78.10	77.40	76.80
Silt %	14.5	13.70	13.90
Clay %	7.40	8.90	9.30
Texture	Loamy sand	Loamy sand	Loamy sand
Nutrients			
No3 (ppm)	8.08	3.20	1.71
NH4 (ppm)	41.00	38.70	42.50
P (ppm)	1.76	1.19	0.82
K (ppm)	210.6	195.00	140.40
Anions (mequ./L)			
Co_3^-	-	-	-
HCO_3^-	2.63	1.31	1.97
Cl^-	20.79	9.90	14.85
$SO_4^=$	35.58	40.72	41.28
Cations (mequ./L)			
Ca^{++}	18.92	20.00	21.00
Mg^{++}	17.22	14.35	15.95
Na^{++}	21.91	16.44	20.35
K^+	0.95	0.74	0.79
Sp	28.00	22.00	21.00
Ece (mmohs)	5.75	5.00	5.75

RESULTS AND DISCUSSION

a) Effect of cultivars:

1. Growth characters:

Plant height, primary and secondary branches / plant as well as total dry matter weight, assessed at 60, 75 and 90 days plant age of the two cultivars; Giza 4 (V_1) and Giza 5 (V_2) were presented in Tables (2, 3). Great similarity was noticed in the behavior of each cultivar at each age in both seasons. At all ages in the two seasons, significant differences between the two cultivars in all characters except number at primary branches at 60 days age in 1999 season, were detected in favour of V_2 in almost all cases.

In both seasons, V_2 surpassed V_1 in plant height, number of secondary branches and dry matter weight at the young age (60 days). Moreover, at 75 and 90 days age, V_2 markedly increased V_1 in all characters except plant height. This may be attributed to the V_1 ability to elongate at 75-90 days ages, was faster than that of V_2. But, unfortunately, V_1 failed to increase other canopy organs which act together as physiological components to maximize the dry matter, consequently its dry matter weights at all stages were lower than the corresponding ones of V_2.

In other words, V_2 was successfully employing the first three characters (as most of the integrated factors for aerial biomass) for increasing its dry matter weight. This is virtually due to its genetic constituent, which control the biomass accumulation (Witzenberger *et al.,* 1985). These results revealed the consistency of both cultivars over years but they responded differently to the available environmental condition because of their different genetic background.

Table 2: Effect of cultivars, combinations of NPK fertilization and their interactions on growth characters of peanut plants in 1999 season.

Treat-ments	60 days				75 days				90 days			
	Plant height (cm)	No. of primary branches	No. of secondary branches	Dry matter weight (g)	Plant height (cm)	No. of primary branches	No. of secondary branches	Dry matter weight (g)	Plant height (cm)	No. of primary branches	No. of secondary branches	Dry matter weight (g)
Varieties (V)												
V1	46.3	6.1	6.9	45.3	57.0	3.4	16.2	85.3	57.1	3.6	17.2	88.9
V2	50.1	6.3	7.7	55.0	53.5	4.9	19.2	89.0	53.6	4.9	19.6	91.4
$LSD_{5\%}$	3.0*	n.s	0.6*	6.1*	1.1**	0.7*	1.7*	1.9*	3.5*	1.1*	2.4*	2.5*
Fertilizer combinations (T)												
T1	41.9	5.4	6.8	44.0	48.7	3.6	15.2	77.9	48.4	3.7	15.8	85.4
T2	47.8	6.5	7.2	49.4	57.1	4.4	17.1	54.2	57.1	4.2	17.3	59.8
T3	52.0	6.2	8.1	55.4	58.9	4.8	18.3	109.3	59.0	5.2	18.5	111.0
T4	52.3	6.8	7.1	52.0	59.1	4.4	17.9	104.5	60.3	4.2	19.3	105.7
T5	50.8	6.3	8.1	58.6	49.6	3.5	19.5	87.6	50.5	3.6	20.5	89.1
T6	44.7	6.0	6.4	41.6	58.1	4.2	18.5	89.1	56.7	4.4	19.0	90.2
$LSD_{5\%}$	2.3**	0.6**	1.1*	3.0**	0.9**	n.s	1.0**	2.9**	1.9**	0.4**	0.8**	3.1**
Interactions (VT)												
V_1T_1	40.3	4.9	6.2	43.5	49.5	2.9	13.3	64.8	50.3	3.1	13.9	78.6
V_1T_2	43.5	6.3	7.6	40.1	57.6	3.1	13.4	46.4	56.4	3.1	13.6	49.1
V_1T_3	49.6	5.3	5.7	45.5	60.8	3.2	15.8	115.4	58.8	3.8	16.0	117.3
V_1T_4	52.7	7.5	7.6	58.9	61.3	4.0	18.7	101.1	63.0	3.9	21.0	101.9
V_1T_5	49.7	6.6	8.6	53.7	53.4	3.6	18.6	82.5	54.5	3.7	20.5	83.9
V_1T_6	42.2	6.0	5.6	30.3	59.1	3.4	17.4	101.3	59.8	3.9	18.2	102.5
V_2T_1	43.4	5.9	7.4	44.6	47.9	4.2	17.0	91.0	46.6	4.3	17.6	92.1
V_2T_2	52.0	6.7	6.8	58.7	56.7	5.6	20.7	62.1	57.8	5.4	20.9	70.5
V_2T_3	54.4	7.1	10.5	65.4	57.0	6.3	20.8	103.2	59.1	6.6	21.1	104.6
V_2T_4	51.9	6.2	6.7	45.0	56.9	4.8	17.1	107.9	57.7	4.4	17.7	109.6
V_2T_5	51.9	6.1	7.7	63.6	45.7	3.4	20.3	92.7	46.6	3.6	20.6	94.2
V_2T_6	47.1	6.0	7.2	53.0	57.0	4.9	19.6	76.9	53.6	5.0	19.8	77.8
$LSD_{5\%}$	3.2**	0.9**	1.6**	4.3**	1.3**	1.3*	1.4**	4.0**	2.7**	0.6**	1.1**	4.3**

*, ** Significant and highly significant at 5%& 1% levels, respectively.

Table 3: Effect of cultivars, combinations of NPK fertilization and their interactions on growth characters of peanut plants in 2000 season.

Treat-ments	60 days				75 days				90 days			
	Plant height (cm)	No. of primary branches	No. of secondary branches	Dry matter weight (g)	Plant height (cm)	No. of primary branches	No. of secondary branches	Dry matter weight (g)	Plant height (cm)	No. of primary branches	No. of secondary branches	Dry matter weight (g)
Varieties (V)												
V1	45.6	5.6	6.9	45.0	56.7	3.5	17.1	87.6	57.2	3.6	16.9	88.6
V2	48.4	6.3	7.9	53.4	53.4	4.9	19.8	93.6	54.0	4.8	19.3	93.2
LSD$_{5\%}$	2.8^{*}	0.5^{*}	0.9^{*}	7.7^{*}	2.8^{*}	0.7^{*}	2.1^{*}	5.3^{*}	2.8^{*}	0.9^{*}	2.0^{*}	3.4^{*}
Fertilizer combinations (T)												
T1	41.7	5.3	7.1	40.6	48.5	3.7	15.4	76.5	49.3	3.4	15.2	84.3
T2	47.8	5.9	7.0	47.4	54.8	5.1	17.3	59.5	56.9	4.6	16.7	60.6
T3	51.6	6.3	8.5	56.8	61.4	4.3	19.0	110.1	58.6	4.5	18.7	111.9
T4	49.1	6.2	7.2	51.2	59.7	4.1	19.8	107.4	59.4	4.4	18.8	104.8
T5	48.6	6.0	8.2	57.4	50.8	3.5	20.5	93.2	52.0	3.8	20.0	89.2
T6	43.3	6.0	6.4	41.9	55.2	4.5	18.8	96.7	57.4	4.3	19.1	94.8
LSD$_{5\%}$	1.8^{**}	0.5^{*}	1.0^{**}	5.6^{**}	2.1^{**}	0.7^{**}	1.2^{**}	5.6^{**}	1.7^{**}	0.4^{**}	1.7^{**}	1.8^{**}
Interactions (VT)												
V_1T_1	39.7	4.8	6.3	44.0	48.9	3.0	13.9	65.6	49.8	3.1	14.0	76.2
V_1T_2	43.2	5.3	7.6	40.5	54.4	3.7	13.6	49.6	55.5	3.8	13.7	50.4
V_1T_3	49.1	5.4	5.7	44.8	61.4	3.0	15.8	115.8	58.5	3.3	16.0	114.2
V_1T_4	49.3	6.5	7.6	56.1	62.5	3.8	20.9	102.1	63.8	3.9	19.7	103.5
V_1T_5	50.3	5.7	8.7	54.3	53.9	3.6	20.4	84.7	55.0	3.7	19.4	84.9
V_1T_6	42.2	5.9	5.6	30.1	59.0	4.1	18.2	107.8	60.7	3.6	18.6	102.5
V_2T_1	43.7	5.6	7.9	37.2	48.1	4.3	17.1	87.4	48.7	3.7	16.4	92.3
V_2T_2	52.5	6.6	6.3	54.2	55.2	6.5	21.0	69.4	58.3	5.3	19.8	70.8
V_2T_3	54.2	7.1	11.3	68.8	61.4	5.6	22.1	104.6	58.6	5.8	21.3	109.7
V_2T_4	49.0	5.9	6.8	46.3	56.9	4.4	18.8	112.7	55.0	5.0	17.8	106.0
V_2T_5	47.0	6.2	7.8	60.6	47.6	3.5	20.6	101.6	49.0	4.0	20.6	93.6
V_2T_6	44.3	6.0	7.3	53.3	51.4	4.9	19.4	85.7	54.1	5.1	19.7	87.1
LSD$_{5\%}$	2.6^{**}	1.0^{**}	1.3^{**}	8.0^{**}	2.9^{**}	1.0^{**}	1.7^{**}	7.9^{**}	2.3^{**}	0.6^{**}	2.5^{**}	2.5^{**}

*, ** Significant and highly significant at 5%& 1% levels, respectively.

2- Yield characters:

Significant differences between the two peanut cultivars were observed for number of seeds/plant, 100-pods weight and seed yield/ faddan in both seasons, number of pods / plant and seeds weight / plant in the first season, and plant height in the second one (Table 4 & Table 5). These results confirmed the above-mentioned conclusion that the two tested cultivars were genetically different. It was noticed that the averages of these characters were higher in the second season than those of the first one, due to varied seasonal climatic conditions. The average seed yield/ faddan of the two cultivars, as final rough product, in the second season increased that of the first one by 18.43%

The data revealed that, in both seasons, V_2 surpassed V_1 in all of these characters except 100-pods weight. These findings indicating again the differential response of the two cultivars and their interactions with the environmental conditions. It is worth to mention that V_2 was taller than V_1 at the harvest time though the reverse was true at 90 days age. But, V_1 had heavier pod weight than V_2. This could be explained on the basis of sink-source balance where the vegetative growth phases facilitate, or fail to facilitate, realization of the yield potential established during reproductive phases (Wallace *et al.,* 1995). It may be that V_1 exhausted most of its photosynthates in early elongation (at 75-90 days age) before completion of reproductive organs development and consequently had little sink (few number of seeds) which received enough photosynthates (after its elongation was stopped) and hence had heavy seeds weight. While V_2 distributed its photosynthates, in late age, on both elongation and reproductive development and consequently had great sink (more number of seeds) but with light weight. The yield data revealed that V_2 outyielded V_1 by 3.8 & 21.2% in the first and second season, respectively.

3. Seed oil and protein contents.

The two tested peanut cultivars were significantly different for the two characters in both seasons (Table 4 & Table 5). In the first and second season, respectively, the advantage was in favour of V_2 for oil content (52.04&51.53%) and of V_1 for protein content (23.00 & 22.78%).

b) Fertilization treatments effects:

1. Growth characters

In both seasons and at all three plant ages, all studied growth characters exhibited significant differences due to varied NPK fertilization treatments (Table 2 & Table 3). At 60 days age, T_4 (30 N+ 30 P+ 50 K) produced the tallest plants, and the highest number of primary branches in 1999 season. These results may be attributed to the relative high K component within T_4 combination up to 50 kg K_2O / faddan, where K plays an active role in the function of enzymes needed for biological processes. Abdel-Halem *et al.*, (1988) and Kankapure *et al.*, (1994) suggested that K had a beneficial effect on growth characters including dry matter. However, Nour El-Din *et al.*, (1986) indicated that K application had no effect on growth characters of peanut plants grown in soil containing high nutrients content.

The effectiveness of T_5 (15N+40P+25K) which gave the highest number of secondary branches and dry matter in both season , may be due to the relative high P quantity which encourage initiation of reproductive organs together with increasing nodule formation. These results are in line with those obtained early by Patil *et al.*, (1982) and Sanker *et al.,* (1984). Otherwise, Mathew *et al.*, (1984) reported that growth characters were not affected by P application. T_3(15N+30P+25K) ranked as the first treatment for producing the highest numbers of primary and secondary branches/plant in only the second season. On the other side, the lowest averages were produced by T_1 for plant height and primary branches in both seasons and dry matter in the second one, as well as by T_6 for secondary branches / plant in the both seasons and dry matter in the first one.

At 75 days plant age, tallest plants produce from T_4 without significant difference from T_3 in 1999 and the reverse in 2000 season. The highest number of primary branches / plant was obtain by T_3 followed by T_4, T_2 and T_6 in the first season and by T_2 in the second season. In both seasons, the highest values of secondary branches / plant and dry matter weights were obtained by T_5 and T_3, respectively. On the other hand, T_1 treatment produced the lowest values of all growth characters in the two seasons, indicating its impropriety for peanut fertilization in such soil.

At 90 days plant age, the tallest plants were produced by T_4, without significant difference from T_3, in both seasons. The greatest number of primary branches was obtained from application of T_3 in 1999 and T_2 in 2000 season. In both seasons, secondary branches / plant and dry matter weights were produced from T_5 and T_3 treatment, respectively. The aforementioned results reflect the importance of both T_3 and T_4, and probably T_5, as appropriate fertilization combinations for improved growth characters, while T_1, and T_6, and may be T_2, were ineffective treatments.

2- Yield characters:

Generally, in both seasons, similar trend was observed for the effect of NPK fertilization treatments on all of the studied characters. The data presented in Tables 4 & 5 show that the NPK fertilizer –combinations were of markedly different effects on all character without exception in the two seasons of experimentation. Significant differences among fertilization treatments were previously detected by some investigators (Angadi *et al.,* 1989; Patil 1992; Patel *et al.,* 1994; Barik *et al.,* 1994, Purushotham and Hosmani, 1994 and Nasr-Alla *et al*., 1998).

Treatment No. 4 (30N+30P+50K) produced the highest values of plant height and number of secondary branches/plant in both seasons, as well as weight of pods/plant, number of seeds/plant and seed yield/faddan in first season. It is essential to note that, this treatment not produced any lowest value for any of the studied characters except 100-pods weight, indicating its efficiency. These results were almost in line with those reported by Abdel-Halem *et al.*, (1988) for nitrogen, Yakadri *et al.*, (1992) for phosphorus, and Gabr (1998), Timmegowdd (1995) and Patra *et al.,* (1995) for potassium, who recommended 60Kg/ha from each nutrient separately for producing best growth and yield. However, Channawar *et al*., (1995) found insignificant effect of NP on peanut yields. Another an effective fertilization combination detected herein was T_3 (15N+30P+25K) where it resulted in highest averages of seeds weight/plant and 100-pods weight in both seasons, as well as number and weights of both pods and seeds/plant and seed yield/faddan in the second season. These results almost confirmed those early reported by Angadi *et al.,* (1989) who suggested the combination of 40N+80P+30K, as well as Barik *et al.*, (1994) who recommended the "20N+60P+40K" kg/ha as best fertilizer-combination for high peanut yield.

The present results indicated the importance of both two treatments mentioned above for the peanut crop under the conditions of this newly reclaimed sandy soil, which suffer from nutrient deficiency. So, addition of these macronutrients in balanced ratio would resulted in proper biomass which is an obvious and first near-fully integrated major component of the process of accumulating the net product i.e. yield. Nitrogen as growth activator, at the rate of 15 to 30 (kg, N/fad.); phosphorus as an important element for reproductive development at the rate of 30 kg. P_2O_5/fad; and potassium as an effective factor for transportation of photosynthates from source to sink, at the rate of 25 to 50 kg K_2O, found to be appreciable as balanced combinations for the peanut production in such soil.

It was found also that T_6 (30N+40P+50K) gave the highest average of the primary branches/plant in both seasons .On the other hand, T_1 (15N+20P+25K) produced the lowest averages for number and weight of seeds/plant and seed yield /faddan in both seasons, number of pods/plant in the first season, and secondary branches/plant and pods weight/ plant in the second season. Also, T_5 (15N+40P+25k) gave the lowest values for plant height, numbers of primary and secondary branches as well as pods weight/plant in the first season, and number of pods/plant in the second one. The present results may be contradicted with other previously ones reported by several authors, due to differences in genetic materials and environmental circumstances.

3-Seed oil and protein contents:

As shown in Tables 4 & 5 oil and protein contents behaved differently where T_2 (30N+20P+50K) produced seeds contained the highest oil contents (52.87 and 52.07%) and the lowest protein contents (22.18 and 21.90%) in the two seasons, respectively. While the highest protein contents were obtained from T_4 (23.54and 23.09%) in both seasons, respectively, but gave the lowest oil percentage (51.01%) in 1999. In 2000 season, the lowest oil percentage was given by T_1 (49.47%). These results may attributed to the increase P component in T_4 up to 30kg P_2O_5 which activate amino acids and then protein development, while its relative decrease in relation to those of N and K inT_2 may be encourage fatty acids formation. In this connection, Abdel -Wahab *et al.*, (1986) found no relevance between oil content and P application. The results detected herein are in agreement with those recorded by Lal and Saran,(1988); Angadi *et al.,*(1989); Yakadri *et al.,* 1992; Barik *et al.,*(1994); Pal *et al;*(1996), Gabr,(1998); and Dahdouh, (1999). However, Nasr-Alla *et al*., (1998) found no effect of P on oil and protein contents of peanut seeds.

C) Interaction effects:

1-Growth characters:

In both seasons and at all plant ages (60,75and 90 days), all studied growth characters showed considerable differences ascribed to the interaction between cultivars and NPK nutrients (Tables 2 & 3). At 60 days age, the most promising interaction was V_2T_3 which gave the highest averages for plant height, number of secondary branches / plant and dry matter weight in the both seasons and number of primary branches /plant in the second season. Greatest number of primary branches in 1999 season was obtained from V_1T_3 without significant difference from V_2T_3. These increases may be attributed to the relative high phosphorus component together with balanced N and K components in T_3 combination as well as to the reliable role of P for encouraging the metabolic processes and consequently increasing dry matter. These results support those obtained by (Patil *et al.,* 1982), (Sankar *et al.,* 1984) and (Nasr- Alla *et al*., 1998). On the other hand, V_1T_1 on plant height and primary branches, and V_1T_6 interaction on secondary branches and dry matter gave the lowest averages in both seasons. These results confirmed the above mentioned ones concerned with ineffectiveness of both T_1 and T_6 fertilization treatments.

At 75 - plant age, tallest plant, highest number of secondary branches and greatest dry weight were produced from V_1T_4, V_2T_3 and V_1T_3 treatments, respectively. However the greatest numbers of primary branches produced from V_2T_3 in 1999 and from V_2T_2 in 2000

On the other hand, the lowest number of primary and secondary branches were recorded on V_1 plants through T_1 treatment in both season, while the least dry weight produced through V_1T_2 in 1999 and through V_1T_2or V_1T_1 treatments in 2000 season.

At 90 plant age, it was found that in both seasons, the most beneficial interactions were V_1T_4 on plant height, V_1T_3 on dry matter weight and V_2T_3 on primary and secondary branches /plant. However, the lowest values were mostly similar to those of 60 days age. These results clearly revealed the effectiveness of T_3 and T_4 fertilizer-combinations for peanut growth. Also, it indicated that the two cultivars behaved differently in regard to their growth habit, where V_1 may be started its elongation early and had an elongated stem attained most of its photosynthates, whereas V_2 seemed to be balanced in distribution of its photosynthates to both growth and reproductive development. Thereby, V_1 had taller plants with lower dry matter weight than V_2, which had more primary and secondary branches.

2-Yield Characters:

The data presented in Tables 4&5 show that the reliable and valuable interaction effects were obtained from V_2 with different fertilization treatment for all characters in both seasons except plant height in the second season and number of pods and primary branches as well as seed index in both seasons, reflecting the suitability and high response of V_2 compared to V_1 cultivar under the conditions of such experiment.

In both seasons, V_2T_3 interaction produced the highest averages of plant height, number of pods /plant and number of seeds /plant. Highest – yield /faddan was obtained from the interaction of V_2 with T_4.The greatest number of secondary branches and pod weight/plant were recorded for V_2T_6 and V_1T_4 interaction, respectively. While the highest number of primary branches was as result of interaction between V_1 with T_6 in the first season and with T_3 in the second one. The heaviest 100-pods weight produced from

V_1T_2 and V_1T_3 in the first and second seasons respectively. These results confirmed again the results discussed above in cultivars effects and growth characters, concerning the different habits and responses of the two cultivars and the effectiveness of T_3 & T_4 treatments. Similar findings were previously reported by several authors (Agasimani and Hosmani, 1989); (Angadi, *et al.,* 1989); (Patil, 1992); (Barik *et al.,*1994); (Patel *et al.,* 1994); (Pal *et al.,* 1996); (Nasr-Alla, 1998) and (El-Far and Abdel-Rahman, 2000).

3-Seed oil and protein contents:

The data revealed that the two tested cultivars had opposite trend for oil and protein contents (Tables 4 & 5). In both seasons, V_2T_2 gave the highest oil content, while V_1T_4 interaction produced the highest protein percentage. However, the lowest values for oil and protein contents were produced from V_1T_3 and V_2T_1 interaction, respectively.

Table 4: Effect of Cultivars, combinations of NPK fertilization and their interactions on yield and its components of peanut plants in 1999 season.

Treat-ments	Plant height (cm)	No. of primary branches	No. of secondary branches	No of pods/ plant	Weight of pods/ plant (g)	No. of seeds/ plant	Weight of seeds /plant (g)	100-pods weight (g)	Seed yield /Fed. (ton)	Seed oil %	Seed protein %
Varieties (V)											
V1	48.7	3.6	23.1	26.2	43.50	29.4	21.83	190.0	1.86	51.14	23.00
V2	51.3	3.7	22.8	32.5	46.02	39.7	31.19	185.1	1.93	52.04	22.36
$LSD_{5\%}$	n.s	n.s	n.s	3.8**	n.s	4.5*	3.89**	4.1*	0.034*	0.68*	0.48*
Fertilizer combinations (T)											
T1	49.7	3.9	20.5	21.1	46.60	29.9	19.63	177.2	1.36	51.29	22.24
T2	51.7	3.5	21.2	29.8	44.15	34.8	27.66	199.9	2.00	52.87	22.18
T3	50.4	3.8	24.9	36.7	50.05	39.5	33.45	200.9	2.02	50.42	23.00
T4	53.1	3.4	25.8	30.8	50.56	40.4	27.24	175.4	2.15	51.01	23.54
T5	46.3	3.1	19.8	28.1	33.44	30.8	24.74	181.4	2.05	51.99	22.48
T6	48.9	4.2	25.3	29.4	43.77	32.0	26.33	190.6	1.79	51.95	22.64
$LSD_{5\%}$	4.0*	0.5**	1.9**	1.7**	3.55**	1.0**	2.59**	6.9**	0.15**	1.20**	0.86*
Interactions (VT)											
V_1T_1	52.8	3.9	21.0	17.6	46.86	25.1	14.54	174.8	1.51	50.77	22.87
V_1T_2	46.1	3.2	20.1	23.3	41.32	24.6	19.60	211.6	1.92	52.48	21.64
V_1T_3	44.7	3.7	24.5	32.8	49.86	33.0	26.16	194.3	2.36	49.56	23.35
V_1T_4	50.1	3.3	26.2	30.6	50.97	36.7	25.37	185.5	1.63	51.28	24.81
V_1T_5	45.2	3.0	23.0	26.1	34.38	31.0	25.01	180.1	1.79	51.25	22.38
V_1T_6	53.6	4.3	23.7	26.6	37.62	26.2	20.28	193.9	1.92	51.51	22.97
V_2T_1	46.7	4.0	20.0	24.7	46.33	34.7	24.71	179.5	1.21	51.81	21.62
V_2T_2	57.2	3.8	22.2	36.3	46.97	45.0	35.71	188.2	2.07	53.27	22.73
V_2T_3	56.1	3.9	25.3	40.6	50.23	45.9	40.73	207.6	1.68	51.28	22.66
V_2T_4	56.1	3.5	25.5	31.1	50.16	44.0	29.12	165.2	2.67	50.73	22.27
V_2T_5	47.3	3.1	16.7	30.0	32.49	30.6	24.47	182.6	2.30	52.75	22.58
V_2T_6	44.2	4.0	27.0	32.3	49.92	37.7	32.37	187.2	1.66	52.40	22.31
$LSD_{5\%}$	5.6**	n.s	2.6**	2.4**	5.02**	n.s	3.66**	9.71**	0.21**	n.s	1.22**

*, ** Significant and highly significant at 5%& 1% levels, respectively.

Table (5): Effect of cultivars, combinations of NPK fertilization and their interactions on yield and its components of peanut plants in 2000 season.

Treat-ments	Plant height (cm)	No. of primary branches	No. of secondary branches	No of pods/ plant	Weight of pods/ plant (g)	No. of seeds/ plant	Weight of seeds/ plant (g)	100-pods weight (g)	Seed yield /Fed. (ton)	Seed oil %	Seed protein %
Varieties (V)											
V1	47.4	3.6	23.9	29.3	47.2	32.0	26.67	209.5	2.0.	50.43	22.78
V2	50.0	3.5	24.1	30.7	43.8	37.7	27.49	197.7	2.46	51.53	22.14
$LSD_{5\%}$	1.1^{*}	n.s	n.s	n.s	n.s	2.5^{*}	n.s	7.1^{*}	0.33^{*}	0.13^{**}	0.48^{*}
Fertilizer combinations (T)											
T1	46.0	3.5	16.1	25.1	33.71	24.9	18.34	200.7	1.93	49.47	21.96
T2	47.8	3.2	21.6	27.5	37.66	29.6	23.52	214.9	2.32	52.07	21.90
T3	49.6	3.9	25.8	35.4	54.63	48.4	37.32	218.8	2.69	50.69	22.92
T4	53.1	3.4	27.1	34.7	48.28	36.0	26.34	188.5	2.40	50.97	23.09
T5	48.6	3.5	26.9	24.9	46.66	31.1	24.56	193.1	2.19	51.46	22.09
T6	47.0	3.8	26.3	32.2	52.07	39.1	32.41	205.5	1.96	51.21	22.82
$LSD_{5\%}$	3.7^{*}	3.6^{**}	1.6^{**}	2.7^{**}	4.15^{**}	1.7^{**}	4.04^{**}	5.6^{**}	0.18^{**}	0.88^{**}	0.55^{**}
Interactions (VT)											
V_1T_1	42.4	3.5	15.8	24.4	33.14	20.8	17.31	197.0	1.71	49.12	22.85
V_1T_2	45.2	2.9	20.3	20.0	26.40	22.6	18.06	221.9	2.18	51.46	21.59
V_1T_3	45.8	4.0	27.3	30.0	51.97	39.6	34.40	227.6	2.67	49.06	22.83
V_1T_4	53.5	3.7	27.2	40.4	60.39	41.3	31.72	203.8	1.74	50.77	24.69
V_1T_5	50.9	3.7	28.1	27.1	57.18	34.0	27.13	197.1	2.10	51.17	21.60
V_1T_6	46.4	3.9	24.4	33.6	53.90	33.9	31.42	209.2	1.77	51.00	23.12
V_2T_1	49.6	3.6	16.4	25.8	34.28	29.1	19.38	204.4	2.14	49.82	21.07
V_2T_2	50.3	3.5	22.8	35.0	48.91	36.7	28.98	207.9	2.42	52.68	22.21
V_2T_3	53.4	3.9	24.2	40.8	57.28	57.2	40.24	210.1	2.70	52.32	23.01
V_2T_4	52.7	3.2	27.0	28.9	36.17	30.7	20.95	173.3	3.06	51.18	21.48
V_2T_5	46.4	3.2	25.8	22.8	36.14	28.2	21.99	189.0	2.27	51.75	22.58
V_2T_6	47.6	3.8	28.1	30.9	23	44.3	33.40	201.7	2.15	51.42	22.52
$LSD_{5\%}$	5.2^{**}	n.s	2.3^{**}	3.75^{**}	5.88^{**}	2.5^{**}	5.72^{**}	7.9^{**}	0.26^{**}	1.25^{**}	0.78^{**}

*,**Significant and highly significant at 5%& 1% levels, respectively.

CONCLUSION:

1-Peanut crop could be successfully grown in the newly reclaimed loamy sand soil.

2-T_3 and /or T_4 were suitable nutrients combinations for improved growth and yield characters.

3-The highest yields (2.7 to 3.1 t/fad. In the 1^{st} & 2^{nd} season, respectively) with acceptable oil and protein contents was obtained from V_2 when fertilized with T_4 nutrient combination.

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سلوك صنفين من الفول السوداني واستجابتهم للتسميد النيتروجيني والفوسفاتي والبوتاسي في أراضي رملية طميية جديدة

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أجريت هذه الدراسة خلال موسمي ١٩٩٩ و ٢٠٠٠ بمزرعة كلية الزراعة بالفيوم بمنطقة دمو (ارض صحراوية حديثة الاستصلاح) لدراسة استجابة صنفين من الفول السوداني "جيز٤ وجيزة ٥" بالنسبة لصفات النمو والمحصول للتسميد النيتروجيني والفوسفاتي والبوتاسي. واختبرت تحت ست معاملات (توليفات) سمادية مكونة من النيتروجين والفوسفور والبوتاسيوم علي الترتيب وهي T_1 (١٥+٢٠+٢٥)، T_2 (٣٠+٢٠+٥٠)، T_3 (١٥+٣٠+٢٥)، T_4 (٣٠+٣٠+٥٠)، T_5 (١٥+٤٠+٢٥)، T_6 (٣٠+٤٠+٥٠).

أظهرت صفات النمو والمحصول ومكوناته ومحتوي الزيت والبروتين استجابة معنوية في معظم الحالات للأصناف ومعاملات التسميد والتفاعل بينهما.وأظهرت الأصناف سلوكا مختلفا أثناء مرحلتي النمو الخضري والثمري ، حيث كانت كل الصفات في صالح الصنف جيزة ٤ ما عدا صفة طول النبات عند عمر ٧٠ ، ٩٠ يوم والبروتين في الموسمين.

أيضا أعطت المعاملة T_3 والمعاملة T_4 من التسميد زيادة معنوية في صفات النمو والمحصول ومكوناته. حيث كانت اعلي القيم للمحصول (٢,٧ ، ٣,١ طن للفدان حلال موسمي الزراعة علي التوالي) وبنسبة زيت وبروتين مقبولة للصنف جيزة (٥) مع التسميد بالمعاملة T_4 . وفي النهاية تشير النتائج إلى إمكانية زراعة هذا المحصول في الأراضي الجديدة تحت ظروف متزنة من العناصر الغذائية المختلفة.