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SOME FACTORS AFFECTING PRODUCTIVITY OF PEANUT (*ARACHIS HYPOGAEA L.*) IN NEWLY CULTIVATED SANDY SOIL

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ABSTRACT: Two field experiments were carried out in the experimental farm, Faculty of Agriculture, Zagazig University at Khattara, Sharkia Governorate, Egypt during 2002 and 2003 seasons to study the effect of hill spacing and gypsum application on yield and yield components of four peanut (*Arachis hypogaea* L.) varieties.

The results indicated the superiority of Gerogorey variety in weight of pods/plant, weight of seeds/plant, seed index, pod, seed, oil and protein yields/fad as well as shelling percentage.

Wide spacing of 25 cm between hills (84,000 plant/fad.) appeared to produce the highest weight of pods, seeds/plant, shelling% and oil yield/fad. However, wide and mid-spacings of 25 and 20 cm between hills produced heavier seeds, higher pod, seed and protein yields/fad as compared with closer spacing of 15 cm between hills.

Application of 500 kg gypsum /fad tended to produce higher shelling percentage and seed, oil and protein yields/fad. However, applying 500 or 1000 kg gypsum/fad produced higher 100-seed weight, seed weight/plant and pod yield/fad.

INTRODUCTION

Peanut is one of the most important oil crops and food seed legume, it contain about 50% oil, 25-30% protein, 20% carbohydrate and 5% fiber and ash and make a substantial contribution to human nutrition (Fageria *et al.*, 1997). Peanut is one of the most important crops which cultivated successfully in newly reclaimed sandy soils in Egypt. Production of oil corps in Egypt is insufficient for local consumption. So, it is of great importance to improve

peanut production, which could be achieved by several agricultural practices, such as chosen the promising varieties, planting density and gypsum application.

Concerning peanut varieties, several investigators showed peanut varietal differences in weight of pods, seeds/plant, 100-seed weight and pod, seed yields/fad of them Basha (1994), Sarhan (2001) and Maha, Abd-Alla (2004). Furthermore, Shams El-Din and Ali (1996) recorded significant differences between peanut varieties in shelling percentage as well as oil and protein yields/fad.

Regarding the influence of hill spacing, Basha (1994) showed that widening hill spacing for peanut from 10 to 20 cm apart significantly increased weight of pods and seeds/plant, 100-seed weight, whereas pod, seed and oil yields/fad were decreased. El-Seesy and Ashoub (1994) found gradual increases in 100-seed weight and shelling percentage with each widening in hill spacing from 10 to 20 then 30 cm. But, in contrast, pod, oil and protein yields/fad were increased with each narrowing in hill spacing. However, Shams El-Din and Ali (1996) showed an increase in peanut pod and protein yields/fad due to narrowing hill spacing from 20 to 10 cm apart. Samira, Hussein *et al.*, (2000) showed that weight of pods/plant and 100-seed weight were decreased significantly by increasing plant density from 70,000 to 140,000 plant/fad, while maximum pod yield was obtained with sowing plants at 140,000 plant/fad. Furthermore, Asmaa, El-Sayed (2003) stated that increasing hill spacing from 15 to 20 then to 25 cm between hills caused a significant increase in weight of pods and seeds/plant, while mid-spacing of 20 cm (84,000 plant/fad) appeared to produce the highest pod, seed yields/fad, the heaviest seed and shelling percentage as well as protein and oil yields/fad as compared with either wider or closer spaces.

With respecting to gypsum application, Eweida *et al.*, (1979) found that application of 500 kg gypsum/fad increased shelling percentage and pod yield/fad, but 100-seed weight was decreased. Omar (1988) showed that increasing gypsum rate from 250 to 750 kg/fad increased weight of pods, seeds/plant and pod yield/fad, while 100- seed weight and shelling percentage were decreased. Ali *et al.*, (1995b)

noticed that application of 500 kg gypsum/fad tended to increase oil yield/fad. In addition Samira, Hussein *et al.,* (2000) indicated that adding 500 kg gypsum/fad significantly increased weight of pods/plant, 100-seed weight, shelling percentage and pod yield/fad. Furthermore, Adhikari *et al.,* (2003) recorded significant increase in oil yield/ha by increasing dose of gypsum from 0 to 400 kg/ha.

MATERIALS AND METHODS

Two field experiments were carried out in the Experimental Farm, Faculty of Agriculture, Zagazig University at Khattara, Sharkia Governorate, Egypt during two summer seasons of 2002 and 2003 to study the effect of hill spacing and gypsum application on yield and yield components of four peanut varieties.

Each experiment included 36 treatments, which were the combinations of four peanut varieties, three hill spacings and three gypsum levels as follows:

1- Peanut varieties:

a- Giza "5" b- Giza "6"
c- Ismailia "1" d- Gerogorey.

2- Hill spacing (planting density):

a- 25 cm between hills (84,000 plant/fad).

b- 20 cm between hills (105,000 plant/fad).

c- 15 cm between hills (140,000 plant/fad)

3- Gypsum application:

a- Without gypsum application.

b- 500 kg gypsum/fad.

c- 1000 kg gypsum/fad.

A split-split plot design with three replicates was used. Peanut varieties were assigned to the main plots, the sub plots included hill spaces (planting densities) while gypsum levels were randomly distributed in the sub-sub plots.

The preceeding corp was faba bean in the first season and sugar beet in the second one, the sub-sub plot area was 8.4 m^2 (2.8 x 3 m) which included 7 rows 40 cm apart. Sowing took place on May 12^{nd} and 19^{th} in the first and the second seasons, respectively. Seed were treated with fungicide (vitavex), three seeds were deposiked in the hill, then plants were thinned to 2 plants/hill after two weeks from planting. Soil were inoculated directly after sowing by specific *Rhizobium* strain. Calcium super phosphate (15.5% P_2O_5) at rate of 200 kg/fad

and potassium sulphate (50% k_2O) at rate of 100 kg/fad were added directly after sowing. Nitrogen fertilizer in form of ammonium sulphate (20% N) at rate of 150 kg/fad was applied after 15 days from sowing. Gypsum ($CaSO_4.2H_2O$) was applied at the beginning of flowering stage (arround 30 days from sowing). Surface irrigation using underground water (850 p.p.m.) was followed. Harvest was done after 120 days from sowing in all varieties except Gerogorey which was harvested after 140 days. The other culture practices were applied as needs. The experimental soil was sandy it had an average pH value of 8.14 and organic mater content 0.85% , the available N, P, K and Ca contents were 19.7, 12.4, 91and 38.5 p.p.m. , respectively (averaged over the two seasons for the upper 30 cm soil depth).

At harvest, ten guarded plants were randomly taken from the second inner two rows of each experimental unit to determine the following characters:

1- Weight of pods/plant "gm".

2- Weight of seeds/plant "gm".

The middle three rows of each experimental unit with area of 3.6 m^2 were harvested to determine the following characters:

1- 100- seed weight "gm".

2- Pod yield "kg/fad".

3- Seed yield "kg/fad".

$$4\text{- Shelling percentage} = \frac{\text{Seed yield "kg/fad"}}{\text{Pod yield "kg/fad"}} \times 100$$

5- Oil yield "kg/fad".

6- Protein yield "kg/fad".

Sufficient amount of dried seeds were milled to fine powder then, a constant samples were used to determine oil and total nitrogen contents in seed as described by A. O. A. C. (1980), where seed oil was extracted by petroleum diethyl ether as a solvent with the help of Soxhelt technique. Whereas total nitrogen was determined using the modified micro Kheldahl method. Total N was multiplied by 6.25 to calculate crude protein content. Thereafter, oil and crude protein yields/fad were calculated by multiplying their contents by seed yield.

The obtained data were subjected to the analysis of varience as described by Snedecor and Cochran (1967). Then a combined analysis was made for both seasons. Duncan's multiple range test (Duncan, 1955) was used to compare among means. In interaction tables, capital and small letters were used to compare rows and columns means, respectively.

RESULTS AND DISCUSSION

Data in Tables (1,2,3 and 4) show the effect of varietal differences, hill spacing and gypsum application on yield and yield components of peanut.

1. Weight of pods/plant "gm":

Weight of pods/plant of peanut during the two seasons of investigation and the combined is presented in Table (1).

Peanut varieties showed significant effects on weight of pods/plant when Gerogorey variety gave the heaviest pod weight/plant followed by Giza "6" variety, however Giza "5" variety produced the lightest pods/plant as compared with other peanut varieties. Several investigaors showed such peanut varietal differences in weight of pods/plant of them Basha (1994), Abd-Alla (1999), Sarhan (2001) and Maha, Abd-Alla (2004).

Also, the differences between hill spaces were highly significant whereas closer space tended to produce lighter pods/plant compared with wider spaces. Therefore, the heaviest pods/plant was achieved by wide spacing of 25 cm which followed by mid-spacing of 20 cm. However, the lightest pods/plant was given by close space of 15 cm between hills. In this connection, El-Seesy and Ashoub (1994) and Asmaa, El-Sayed (2003) cleared that the decreasing in plant density followed with a consistent increase in weight of pods/plant. Also, the obtained results are in agreement with those reported by Basha (1994) and El-Far and Ramadan (2000).

Likely, the gypsum application results showed highly significant differences when the low gypsum rate of 500 kg/fad appeared to produce the heaviest pods/plant during the first season and the combined which followed by the high gypsum rate of 1000 kg/fad. However, no significant differences could be detected between both gypsum rates applied in the second season. Otherwise, the lightest pods/plant was given when no gypsum was applied during the two seasons and the combined. These results are in accordance with those reported by Omar (1988), Ali *et al.*, (1995 a), Samira, Hussen *et al.*, (2000).

Finally, the significant interaction effects between the studied factors on weight of

pods/plant showed that the interaction between peanut varities and hill spaces (Table 1-a) confirmed the superiority of Gerogorey variety under different hill spaces in this respect. On the other direction, wider spaces tended to produce heavier pods/plant with the four peanut varieties investigated. Thus, the heaviest pods/plant (22.41 gm) was achieved by Gerogorey variety when wide space of 25 cm between hills was used. Contrariwise, the lightest pods/plant (10.73) was obtained by Giza "5" variety with close spacing of 15 cm between hills.

In addition, the significant interaction between peanut varieties and gypsum application (Table 1-b) showed that Gerogorey variety produced the heaviest pods/plant with different gypsum levels. Also, the application of gypsum increased the weight of pods/plant with peanut varieties investigated. Therefore, the heaviest pods/plant (19.20 gm) was given by Gerogorey variety when 500 kg gypsum was added. However, the lowest pods weight/plant (11.77 gm) was obtained by Giza "5" variety when no gypsum was applied.

2. Weight of seeds/plant "gm":

Data concerning weight of seeds/plant during the seasons and the combined are given in Table (1).

Peanut varieties revealed highly significant differences through the growing seasons and the combined where Gerogorey variety outyielded the other varieties which followed by Giza "6" and Ismailia "1" varieties. However, Giza "5" variety produced the lowest seeds weight/plant. The superiority of Gerogorey variety in seeds weight/plant was expected, since it was produced the heaviest pods weight/plant (Table 1) as compared with other peanut varieties evaluated. Other investigators noticed such varietal differences in seeds weight/plant of peanut included Basha (1994), Sarhan (2001) and Maha, Abd-Alla (2004).

Regarding the influence of hill spaces on seeds weight/plant, the results revealed highly significant differences where the light density of 25 cm between hills gave the highest seed yield/plant followed by middle density of 20 cm, then the dense planting of 15 cm between hills recorded the lowest seeds

weight/plant. The reduction in seed yield/plant at dense planting or closer space of 15 cm may be due to the reduction in weight of pods/plant which could be resulted from the competition between individual plants straggling for available nutrients, water and light in the surrounding media. In this connection, Basha (1994), El-Shahat (2001) and Asmaa, El-Sayed (2003) reported that either widening hill spaces or decreasing number of peanut plants/fad significantly increased seed weight/plant.

Concerning the influence of gypsum application on seed yield/plant, the results indicated highly significant differences and almost followed the same patterns of weight of pods/plant former discussed when the gypsum application improved that trait and consequently increased seed yield/plant with no significant differences between both applied rates, regarding the combined data. Otherwise, the lowest seed yield/plant. was obtained when no gypsum was applied. These results are in accordance with those reported by Omar (1988), and Ali *et al.*, (1995 a).

The significant interaction effects between the studied factors on weight of seeds/plant showed that the interaction between peanut varieties and hill spaces (Table 1-a) indicate that Gerogorey variety outyielded the other peanut varieties with different hill spaces. On the other side, wider space of 25 cm appeared to produce higher seed yield/plant with different peanut varieties. Thus, the highest seed yield/plant (11.24 gm) was achieved by Gerogorey variety when wide spacing of 25 cm between hills was applied.

Furthermore, the significant interaction between peanut varieties and gypsum application on weight of seeds/plant (Table 1-b) confirmed the superiority of Gerogorey variety with different gypsum rates. Also, the application of gypsum by either applied rates tended to increase seed yield/plant of different peanut varieties. Then, the lowest seed yield/plant (5.27 gm) was resulted by Giza "5" variety when no gypsum was added.

Finally, the significant interaction between hill spaces and gypsum application on weight of seeds/plant (Table 1-c) showed that wide space of 25 cm between hills gave the highest seed yield/plant with different gypsum rates. Likely, the application of gypsum at either 500 or 1000 kg/fad rates appeared to produce

higher seed yield/plant under different hill spaces used. Thus, the lowest seed yield/plant (4.85 gm) was obtained by close spacing of 15 cm between hills when no gypsum was added.

3. Hundered –Seed weight "gm":

Data pertaining to the influence of studied factors on 100-seed weight during both seasons and the combined are presented in Table (2).

Concerning peanut varieties, the results revealed highly significant differences whereas Gerogorey variety appeared to had heaviest seeds (63.55 gm) followed by Giza "6" one (57.60 gm). However, the lowest 100-seed weight (55.51 gm) was obtained by Giza "5" variety, regarding the combined data. The differences among peanut varieties in 100-seed weight are mainly due to genetical variations and its interaction with environmental conditions in addition it was followed the former discussed yield attributes (weight of pods and weight of seeds/plant). Several investigators showed such varietal differences in 100-seed weight of peanut of them Basha (1994), Shams El-Din and Ali (1996), El-Sawy *et al.*, (2000), Adhikari *et al.*, (2003) and Maha, Abd-Alla (2004).

Furthermore, hill spaces results indicated highly significant differences in 100-seed weight during both seasons and the combined, whereas wide and mid-spaces of 25 and 20 cm tended to produce heavier seeds. However, close spacing of 15 cm produced the lightest seeds during the seasons and the combined. In this connection, El-Far and Ramadan (2000) stated that hill spaced at 20 cm recorded the heaviest seeds of peanut compared with either wider spaces of 25 and 30 cm or close space of 15 cm. Also, Samira Hussein et al., (2000) and El-Shahat (2001). However, the reverse was observed by Salem *et al.*, (1984).

Generally, gypsum application tended to increase 100-seed weight which confirmed significantly during the seasons of investigation and followed the same patterns of other yield attributes indicating the vital role of gypsum in improving such yield component of peanut. However, no significant differences could be detected between the two gypsum applied rates of 500 and 1000 kg/fad during the second season and the combined as well in this respect. These results are in harmony with those reported by

Ali *et al.*, (1995 b), Samira, Hussein *et al.* (2000) and Adhikari *et al.*, (2003).

With respecting to the significant interaction effects between the studied factors on 100-seed weight, the interaction between peanut varieties and hill spaces (Table 2-a) confirmed the superiority of Gerogery variety under the different hill spaces used in 100-seed weight. On the other direction, wider hill spaces appeared to produce heavier seeds of Giza "6" and Gerogery varities. Thus, the heaviest 100-seed of 65.87 gm was achieved by Gerogery variety when wide space of 25 cm between hills was used.

The significant interaction effect between hill spaces and gypsum application on 100-seed weight (Table 2-b) indicate that wider spaces tended to produce heavier seeds under different levels of gypsum. Also, the application of 500 kg/fad of gypsum appeared to produce heavier seeds with different hill spaces. Therefore, heavier 100-seed weight of 60.49 and 60.20 gm were produced by wider spaces of 20 and 25 cm between hills when 500 kg/fad of gypsum was applied. Otherwise, the lightest 100-seed weight of 53.07 gm was given by close spacing of 15 cm between hills when no gypsum was added.

4. Pod yield "kg/fad":

Data presented in Table (2) show the varietal differences of peanut varieties and the effect of hill spaces and gypsum application on pod yield/fad.

Meanwhile, varietal differences results indicated highly significant differences among peanut varieties when Gerogorey variety outyielded the other peanut varieties through seasons and the combined which followed by Giza "6" and Ismailia "1" varieties. However, Giza "5" variety produced the lowest pod yield/fad as compared with other peanut varieties. These results followed the same patterns of the most yield attributes former discussed which all stated the superiority of Gerogorey variety on other peanut varieties. The average of pod yield/fad amounted to 925.98, 1056.26, 1098.44 and 1265.63 kg/fad for Giza "5", Giza "6", Ismailia "1" and Gerogorey varieties in the same following order, concerning the combined data. Many experimenters showed the varietal differences of peanuts in pod yield per unit area of land included Madkour *et al.*, (1992), Abd-Alla (1999), Adhikari *et al.*, (2003) and Maha, Abd-Alla (2004).

Regarding the influence of hill spacing on pod yield/fad, the results revealed highly significant differences during both seasons and the combined whereas mid-spacing of 20 cm between hills (105,000 plant/fad) and wide-spacing of 25 cm (84,000 plant/fad) produced higher pod yield/fad as compared with close spacing of 15 cm (140,000 plant/fad). In other words, the mid-density of 105,000 plants/fad appeared to be better density as compared with dense planting of 140,000 plant/fad. These results are in accordance with those reported by Shams El-Din and Ali (1996), El-Far and Ramadan (2000), El-Shahat (2001) and Asmaa, El-Sayed (2003).

Likely, gypsum application results revealed highly significant differences during both seasons and the combined as well whereas gypsum application generally appeared to be significantly increased pod yield/fad during the seasons of investigation indicating the importance of gypsum in improving peanut production under such conditions. However, no significant differences could be detected between the two gypsum applied rates of 500 and 1000 kg/fad in pod yield/fad. According to the results obtained of this investigation, the application of gypsum increased pod yield/fad of peanut by arround 10.5% compared to without gypsum application. Similar results were reported by several investigators of them Ali *et al.*, (1995a), Samira, Hussein *et al.*, (2000) and Adhikari *et al.*, (2003). However, Abd-El-Motaleb (1983) showed that gypsum application had no significant effects on pod yield of peanut.

Furthermore, the significant interaction effect between peanut varieties and hill spaces on pod yield/fad (Table 2-a) revealed the superiority of Gerogorey variety under different hill spaces used. On the other direction, wider space of 25 cm tended to produce higher pod yield/fad of Giza "5" Giza "6" and Ismailia varieties, while mid-space of 20 cm gave the highest pod yield/fad (1495.94 kg) with Gerogorey variety. Otherwise, the lowest pod yield/fad (787.05 kg) was given by Giza "5" variety when dense planting of 15 cm between hills was applied.

Morover, the significant interaction effect between hill-spaces and gypsum application on pod yield/fad (Table 2-b) indicated that mid and wider-spaces of 20

and 25 cm between hills on one side and the two applied rates of gypsum on the other side tended to produce higher pod yield/fad as compared with either close space of 15 cm or without gypsum application on both sides. Therefore, mid-space of 20 cm between hills gave the highest pod yield/fad when gypsum rate of 500 kg/fad was added. However, the lowest pod yield/fad of 868.08 was obtained by close spacing of 15cm when no gypsum was added.

5. Seed yield "kg/fad":

Varietal differences and the influence of hill spacing and gypsum application on seed yield/fad of peanut results during the two succeeded seasons and the combined are presented in Table (3).

Varietal differences results showed highly significant differences among peanut varieties in seed yield/fad whereas Gerogorey variety outyielded the other peanut varieties followed by Ismailia "1" and Giza "6" varieties, while Giza "5" variety produced the lowest seed yield/fad. These results almost followed the same patterns of pod yield/fad and yield attributes which all indicated the superiority of Gerogorey variety as compared with other peanut varieties investigated. The relative increase in seed yield/fad achieved by Gerogorey variety amounted to 55.86, 26.17 and 25.66% compared to Giza "5", Giza "6" and Ismailia "1" varieties, respectively. In this connection, Madkour *et al.*, (1992). Basha (1994), Abd-Alla (1999), Adhikari *et al.*, (2003) and Maha Abd-Alla (2004) showed the significant differences among peanut varieties investigated in seed yield.

Regarding the influence of hill spacing on seed yield/fad, the results revealed highly significant differences during both seasons and the combined as well when both wide and mid-spacing of 25 and 20 cm between hills produced higher seed yield/fad as compared with close space of 15 cm between hills. Also, no significant differences could be detected between wide and mid-spaces in seed yield/fad neither during the two seasons nor at the combined data. These results followed the same patterns of pod yield/fad. and 100-seed weight (Table 2) while wide-space of 25 cm gave heavier pods and seeds/plant (Table 1) which could not componsate the reduction occurred in plant population/fad. Thus, no

significant differences were observed between wide and mid-spaces in pod and seed yields/fad. In this connection, Madkour *et al.*, (1992) and Asmaa, El-Sayed (2003) reported that increasing plant population up to 84.000 plant/fad increased seed yield/fad of peanut as compared with both lighter or denser densities.

Furthermore, gypsum application appeared to be increased seed yield/fad during the two seasons and the combined as well. Such positive effects were observed throughout the most yield attributes, in additions it was confirmed highly significant annually and in the combined. Then, the gypsum application rate of 1000 kg/fad gave the highest seed yield/fad which followed by gypsum application rate of 500 kg/fad, while the lowest seed yield/fad was given when no gypsum was added. Such results stated the vital role of gypsum in improving the productivity of peanut. In addition, similar findings were noticed by Ali *et al.*, (1995 a) and Adhikari *et al.*, (2003).

With respecting to the signification interaction effects between the studied factors on seed yield/fad, the interaction between peanut varieties and hill spaces (Table 3-a) indicated the superiority of Gerogorey variety under different hill spaces. On the other direction, wide and mid-spaces appeared to produce higher seed yield/fad of Giza "5" and Ismailia "1" varieties, however the highest seed yield/fad (822.21 kg) was achieved by Gerogorey variety when mid-space of 20 cm between hills was used. On the contrary, the lowest seed yield of 323.05 kg/fad was given by Giza "5" variety with close space of 15 cm between hills.

At last, the significant interaction effect between hill spaces and gypsum application on seed yield/fad (Table 3-b) showed that both wide and mid-spaces between hills appeared to produce higher seed yield/fad with gypsum application of 500 or 1000 kg/fad. On the other side, adding gypsum generally increased seed yield under different hill spaces. The highest seed yield (668.67 kg/fad) was obtained by wide spaces of 25 cm between hills when 1000 kg gypsum /fad was added. However, the lowest seed yield (381.94 kg/fad) was produced by close space of 15 cm between hills when no gypsum was added.

6. Shelling percentage:

Shelling percentage results which countered by dividing seed yield by pod yield as percentage are given in Table (3).

Regarding varietal differences, the results revealed significant and highly significant differences, whereas Gerogorey variety had the highest shelling percentage during the seasons and the combined which followed by Giza "6" variety. Such results were expected, since Gerogorey variety was produced the highest seed and pod yields/fad and subsequently gave the highest shelling percentage as compared with other peanut varieties investigated. Varietal differences in shelling percentage of peanut were also observed by Shams El-Din and Ali (1996), Abd-Alla (1999) and El-Sawy *et al.*, (2000).

Concerning the influence of hills spacing on shelling percentage, the results showed highly significant differences whereas shelling percentage appeared to be increase as wide spaces were used. Then, the highest shelling percentage was achieved by wide-spacing of 25 cm followed by mid-space of 20 cm between hills. However, the dense planting of 15 cm between hills gave the lowest shelling percentage. These results followed the same patterns of pod and seed yields/plant (Table 1) where wide-spacing of 25 cm was produced the highest values of both traits and subsequently gave the highest shelling percentage. In this connection, El-Seesy and Ashoub (1994) showed a gradual increase in shelling percentage with each widening in hill spacing from 10 to 20 and up to 30 cm. In addition, the obtained results are in a good line with those reported by Salem *et al.*, (1984) and El-Shahat (2001).

Likely, gypsum application results showed highly significant differences, when the results almost followed the same patterns of seed yield/fad whereas the high application rate of gypsum (1000 kg/fad) achieved the highest seed yield/fad as well as the highest shelling percentage. Then, the lowest shelling percentage was recorded by without gypsum application treatment. Such general trend was confirmed significantly during the seasons and the combined indicating the importance role of gypsum in increasing seed yield rather than pod hulls of peanut. These results

are in agreement with those reported by Abd-El-Motaleb (1983) and Adhikari *et al.*, (2003).

With respecting to the significant interaction effects between the studied factors on shelling percentage, the interaction between peanut varieties and hill spaces (Table 3-a) showed that Gerogorey variety gave higher shelling percentage with mid and close space of 20 and 15 cm between hills. On the other direction, wide and mid-spaces appeared to record higher shelling percentage with Giza "6" and Gerogorey varieties. The highest shelling percentages of 54.87% was achieved by Gerogorey variety when mid-space of 20 cm between hills was applied. Otherwise, the lowest shelling percentage (41.72) was given by Giza "5" variety when close spacing of 15 cm was used.

Furthermore, the significant interaction effect between peanut varieties and gypsum application on shelling percentage (Table 3 – b) stated the superiority of Gerogorey variety in shelling percentage under different gypsum application treatments. On the other hand, adding 1000 kg gypsum/fad appeared to record higher shelling percentage with different peanut varieties investigated. Therefore, the highest shelling percentage (55.17) was achieved by Gerogorey variety when 1000 kg gypsum was applied. However, the lowest shelling percentage (41.93) was given by Giza "5" variety when no gypsum was added.

Finally, the significant interaction effect between hill spaces and gypsum application on shelling percentage (Table 3-c) showed that wide-spacing of 25 cm between hills gave higher shelling percentage under different gypsum treatments. Also, the high rate of gypsum (1000 kg/fad) achieved higher shelling percentage with different hill spaces. Thus, the highest shelling percentage of 55.64 was obtained by wide-spacing of 25 cm when 1000 kg gypsum was added. However, the lowest shelling percentage (43.54) was given by close spacing of 15 cm between hills when no gypsum was added.

7. Oil yield " kg/fad":

Data pertaining to the influence of studied factors on oil yield of peanut seeds during the two seasons and the combined are presented in Table (4).

Regarding varietal differences, the results revealed highly significant differences

through the seasons and the combined, whereas Gerogorey variety produced the highest oil yield (325.21 kg/fad.) followed by Giza "6" (262.29 kg/fad) and Ismailia "1" (256.24 kg/fad) varieties, however, Giza "5" variety gave the lowest oil yield (211.69 kg/fad), concerning the combined data. The relative increase in oil yield/fad achieved by Gerogorey variety amounted to 53.63, 26.92 and 23.99% compared to Giza "5", Ismailia "1" and Giza "6" varieties, respectively. These results almost followed the same patterns of yield and yield attributes former discussed through this investigation. In addition, Shams El-Din and Ali (1996) and Venkatesh *et al.*, (2002) showed such significant differences among peanut varieties in oil yield.

Concerning the influence of hill spaces on oil yield of peanut seeds, the results indicated highly significant differences, when wide-space of 25 cm appeared to produce the highest oil yield followed by mid-space of 20 cm, while the close space of 15 cm or the dense planting gave the lowest oil yield/fad. These results almost followed the same patterns of yield and yield attributes which confirmed the superiority of wid-spacing in producing higher seed yield and higher seed oil percentage which in turn produced the highest oil yield/fad. Salem *et al.*, (1984) showed a significant increase in oil yield due to increasing peanut population from 33,333 to 70,000 plant/fad. Also, Asmaa, El-Sayed (2003) reported that the highest oil yield/fad was achieved by planting 84,000 plant/fad. However, El-Seesy and Ashoub (1994) and Shams El-Din and Ali (1996) showed that widening hill spaces significantly decreased oil yield of peanut seeds.

Likely, gypsum application results indicated highly significant differences through both seasons and the combined as well, whereas, oil yield/fad appeared to be significantly increased as gypsum application rate was increased. Then, the superiority of 1000 kg gypsum/fad was observed and achieved the maximum oil yield/fad (291.24 kg) which followed by 500 kg gypsum rate (271.91 kg), while the lowest oil yield/fad (228.42 kg) was given when no gypsum was added, concerning the combined results. Such results were expected, since 1000 kg gypsum rate was outyielded other two gypsum

treatments in seed yield/fad and seed oil percentage which are the basis for oil yield/fad calculation. Also, the obtained results are in accordance with those reported by Ali *et al.*, (1995 b), Venkatesh *et al.*, (2002) and Adhikari *et al.*, (2003).

Finally, the significant interaction effect between peanut varieties and hill spaces on oil yield/fad (Table 4-a) stated the superiority of Gerogorey variety with different hill spaces. On the other direction, wide and mid-spaces appeared to produce higher oil yield/fad with different peanut varieties investigated. Therefore, the highest oil yield/fad (384.82 kg) was obtained by Gerogorey variety when mid-space of 20 cm was applied. Otherwise, the lowest oil yield/fad (153.04 kg) was given by Giza "5" variety when close space of 15 cm was applied.

8. Protein yield "kg/fad":

Data pertaining to the effect of studied factors on protein yield "kg/fad" through the seasons and the combined are presented in Table (4).

With respecting to peanut varieties, the results revealed highly significant differences during the seasons and the combined as well, where Gerogorey variety achieved the highest protein yield followed by Ismailia "1" and Giza "6" varieties, while Giza "5" variety produced the lowest protein yield. These results followed the same patterns of former discussed yield and yield attributes which all existed the superiority of Gerogorey variety especially in seed yield/fad and seed protein percentage which are the basis for account protein yield/fad. In this connection, Shams El-Din and Ali (1996) indicated that peanut varieties under investigation differed significantly in protein yield.

Concerning the effect of hill spaces on protein yield/fad, the results indicated that wide and mid-spaces of 25 and 20 cm between hills appeared to produce higher protein yield as compared with dense planting of 15 cm between hills which produced the lowest protein yield/fad. This definit trend was confirmed during the seasons and the combined as well, also followed the same patterns of 100- seed weight, seeds and pods yields/fad. Salem *et al.*, (1984) recorded a significant increase in protein yield due to increasing peanut population from 23,333 to 70,000 plant/fad. In addition, Asmaa, El-Sayed (2003)

indicated that the highest protein yield/fad was achieved by mid-space of 20 cm between hills (84,000 plant/fad) as compared with either denser or lighter planting densities. However, El-Seesy and Ashoub (1994) and Shams El-Din and Ali (1996) showed that widening hill spaces significantly decreased protein yield of peanut seeds.

Likely, gypsum application results revealed highly significant differences where application and increasing gypsum rate tended to increase protein yield/fad. Then, the highest protein yield/fad was achieved by adding 1000 kg gypsum/fad which followed by the gypsum rate of 500 kg/fad, while the lowest protein yield was given by without gypsum application treatment. The relative increase in protein yield achieved by adding 1000 kg gypsum/fad amounted to 23.91 and 6.21% compared to without gypsum application and adding 500 kg gypsum/fad, respectively. Similar results were reported by Venkatesh *et al.*, (2002) who found that protein yield of peanut seeds was significantly increased by applying of gypsum.

Regarding the significant interaction effects between the studied factors on protein yield/fad, the interaction between peanut varieties and hill spaces (Table 4-a) stated the superiority of Gerogorey variety in protein yield/fad with different hill spaces used. On the other side, both mid and wide-spaces appeared to produce higher protein yield with different peanut varieties investigated. Therefore, the highest protein yield/fad of 196.48 kg/fad was achieved by Gerogorey variety when mid-space of 20 cm was used. On the contrary, the lower protein yield/fad (80.51kg) was given by Giza "5" variety when close spacing of 15 cm between hills was used.

Finally, the significant interaction effect between peanut varieties and gypsum application on protein yield (Table 4-b) indicate that Gerogorey variety outyielded other peanut varieties under different gypsum application treatments. On the other direction, application of gypsum tended to increase protein yield/fad with different peanut varieties investigated. Then, the highest protein yield of 188.09 kg/fad was obtained by Gerogorey variety when 1000 kg gypsum/fad. was applied. Otherwise, Giza "5" variety gave the lowest protein yield/fad (86.43 kg) when no gypsum was applied.

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Table (1): Weight of pods per plant "gm" and weight of seeds per plant "gm" of peanut as influenced by varietal differences, hill spacing and gypsum application during two growing seasons (2002 and 2003) and the combined.

Main effects and interactions	Weight of pods/plant			Weight of seeds/plant		
	First season	Second season	Combined	First season	Second season	Combined
Varieties (V):						
Giza "5"	15.51 b	11.17 c	13.34 c	7.33 c	5.47 c	6.40 c
Giza "6"	16.37 b	12.31 c	14.34 b	8.83 b	6.06 bc	7.45 b
Ismailia "1"	13.67 c	13.61 b	13.64 c	6.49 d	6.95 b	6.72 c
Gerogorey	20.55 a	15.61 a	18.08 a	10.26 a	8.70 a	9.48 a
F- test	**	**	**	**	**	**
Hill spacing (D):						
25 cm between hills (84,000 plant/fad.)	19.33 a	15.85 a	17.59 a	10.58 a	8.11 a	9.35 a
20 cm between hills (105,000 plant/fad.)	17.44 b	14.12 b	15.78 b	8.54 b	7.17 b	7.85 b
15 cm between hills (140,000 plant/fad.)	12.80 c	9.56 c	11.18 c	5.56 c	5.10 c	5.33 c
F- test	**	**	**	**	**	**
Gypsum treatment (G):						
Without application	14.81 c	12.26 b	13.54 c	7.01 c	6.30 c	6.65 b
500 kg / fad.	17.81 a	13.57 a	15.69 a	9.07 a	6.86 b	7.96 a
1000 kg/ fad.	16.96 b	13.70 a	15.33 b	8.61 b	7.22 a	7.91 a
F- test	**	**	**	**	**	**
Interactions:						
V x D	**	**	**	**	**	**
V x G	**	**	**	**	N.S	**
D x G	**	N.S	N.S	**	**	**
V x D x G	**	**	**	**	**	**

Table (1-a): Weight of pods per plant "gm" and weight of seeds per plant "gm" of peanut as affected by the interaction between peanut varieties and hill spaces "combined data".

Varieties	Hill spaces		
	25 cm	20 cm	15 cm
	Weight of pods per plant "gm"		
	A	B	C
Giza "5"	15.77 b	13.50 c	10.37 a
	A	B	C
Giza "6"	16.60 b	15.03 b	11.39 a
	A	A	B
Ismailia "1"	15.57 b	14.45 bc	10.90 a
	A	B	C
Gerogorey	22.41 a	20.14 a	11.68 a
	Weight of seeds per plant "gm"		
	A	B	C
Giza "5"	8.10 b	6.18 c	4.91 a
	A	A	B
Giza "6"	8.88 b	8.09 b	5.37 a
	A	B	B
Ismailia "1"	9.16 b	5.98 c	5.01a
	A	A	B
Gerogorey	11.24 a	11.16 a	6.03 a

Table (1-b): Weight of pods per plant "gm" and weight of seeds per plant "gm" of peanut as affected by the interaction between peanut varieties and gypsum treatments "combined data".

Varieties	Gypsum treatments		
	0.0 kg/fad.	500 kg/fad.	1000 kg/fad.
	Weight of pods per plant "gm"		
	C	A	B
Giza "5"	11.77c	14.42 c	13.82 c
	C	A	B
Giza "6"	13.11 b	15.24 b	14.68 b
	B	A	A
Ismailia "1"	13.20 b	13.88 d	13.84 c
	B	A	A
Gerogorey	16.06 a	19.20 a	18.97 a
	Weight of seeds per plant "gm"		
	B	A	A
Giza "5"	5.27 c	6.99 c	6.93 c
	B	A	A
Giza "6"	6.60 b	7.84 b	7.89 b
	B	A	A
Ismailia "1"	6.33 b	6.95 c	6.86 c
	B	A	A
Gerogorey	8.40 a	10.08 a	9.95 a

Table (1-c): Weight of seeds per plant "gm" of peanut as affected by the interaction between hill spaces and gypsum treatments "combined data".

Hill spaces	Gypsum treatments		
	0.0 kg/fad.	500 kg/fad.	1000 kg/fad.
	B	A	A
25 cm	8.20 a	9.78 a	10.06 a
	B	A	A
20 cm	6.90 b	8.50 b	8.16 b
	B	A	A
15 cm	4.85c	5.62 c	5.52 c

Table (2): 100- seed weight "gm" and pod yield "kg/fad." of peanut as influenced by varietal differences, hill spacing and gypsum application during two growing seasons (2002 and 2003) and the combined.

Main effects and interactions	100-seed weight "gm"			Pod yield "kg/fad."		
	First season	Second season	Combined	First season	Second season	Combined
Varieties (V):						
Giza "5"	57.29 b	53.73 b	55.51 c	1085.55 bc	766.41 d	925.98 c
Giza "6"	61.05 a	54.16 b	57.60 b	1166.11 b	946.41 c	1056.26 b
Ismailia "1"	54.60 b	54.26 b	54.43 c	1064.52 c	1132.37 b	1098.44 b
Gerogorey	63.10 a	64.76 a	63.55 a	1317.04 a	1214.22 a	1265.63 a
F- test	**	**	**	**	**	**
Hill spacing (D):						
25 cm between hills (84,000 plant/fad.)	61.41 a	58.05 a	59.45 a	1216.14 b	1116.17 a	1166.15 a
20 cm between hills (105,000 plant/fad.)	58.64 b	58.43 a	58.53 a	1256.61 a	1094.00 a	1175.30 a
15 cm between hills (140,000 plant/fad.)	56.98 c	53.70 b	55.34 b	1002.17 c	834.39 b	918.28 b
F- test	**	**	**	**	**	**
Gypsum treatment (G):						
Without application	57.10 b	55.26 b	56.18 b	1089.44 b	940.64 b	1015.04 b
500 kg / fad.	60.36 a	57.34 a	58.85 a	1200.97 a	1041.30 a	1121.14 a
1000 kg/ fad.	59.57 a	57.58 a	58.29 a	1187.50 a	1062.61 a	1123.55 a
F- test	**	**	**	**	**	**
Interactions:						
V x D	N.S	**	**	**	**	**
V x G	N.S	N.S	N.S	*	N.S	N.S
D x G	N.S	**	**	N.S	N.S	**
V x D x G	N.S	**	**	**	*	**

Table (2-a): 100- seed weight "gm" and pod yield "kg/fad." of peanut as affected by the interaction between peanut varieties and hill spaces "combined data".

Varieties	Hill spaces		
	25 cm	20 cm	15 cm
	100- seed weight "gm"		
Giza "5"	A 55.68 c	A 56.24 c	A 54.61 b
Giza "6"	A 60.26 b	A 59.49 b	B 53.06 b
Ismailia "1"	A 55.98 c	A 53.65 c	A 53.66 b
Gerogorey	A 65.87 a	A 64.74 a	B 60.03 a
	Pod yield "kg/fad."		
Giza "5"	A 1007.44 c	A 983.44 c	B 787.05 b
Giza "6"	A 1232.83 ab	B 1041.44 c	C 894.50 ab
Ismailia "1"	A 1125.50 bc	A 1180.39 b	B 989.44 a
Gerogorey	B 1298.83 a	A 1495.94 a	C 1002.11 a

Table (2-b): 100- seed weight "gm" and pod yield "kg/fad." of peanut as affected by the interaction between hill spaces and gypsum treatments "combined data".

Hill spaces	Gypsum treatments		
	0.0 kg/fad.	500 kg/fad.	1000 kg/fad.
	100- seed weight "gm"		
25 cm	B 58.68 a	A 60.20 a	AB 59.47 a
20 cm	C 56.79 b	A 60.49 a	B 58.32 ab
15 cm	B 53.07 c	A 55.86 b	A 57.08 b
	Pod yield "kg/fad."		
25 cm	B 1091.58 a	A 1210.62 a	A 1196.25 a
20 cm	B 1085.45 a	A 1227.71 a	A 1212.75 b
15 cm	B 868.08 b	A 925.08 b	A 961.66 c

Table (3): Seed yield "kg/fad." and shelling percentage of peanut as influenced by varietal differences, hill spacing and gypsum application during two growing seasons (2002 and 2003) and the combined.

Main effects and interactions	Seed yield "kg/fad."			Shelling percentage		
	First season	Second season	Combined	First season	Second season	Combined
Varieties (V):						
Giza "5"	478.41 c	380.36 d	429.38 c	43.80 b	48.69 c	46.24 c
Giza "6"	586.34 b	474.52 c	530.43 b	49.79 a	50.19 bc	49.99 b
Ismailia "1"	459.44 c	605.66 b	532.55 b	43.10 b	53.06 ab	48.08 bc
Gerogorey	651.14 a	787.30 a	669.22 a	49.45 a	55.28 a	52.36 a
F- test	**	**	**	**	*	**
Hill spacing (D):						
25 cm between hills (84,000 plant/fad.)	614.18 a	593.99 a	604.03 a	50.55 a	52.80 a	51.67 a
20 cm between hills (105,000 plant/fad.)	593.63 a	589.11 a	591.37 a	46.85 b	52.61 a	49.73 b
15 cm between hills (140,000 plant/fad.)	423.68 b	427.78 b	425.73 b	42.50 c	49.99 b	46.24 c
F- test	**	**	**	**	**	**
Gypsum treatment (G):						
Without application	473.02 b	464.81 c	468.91 c	43.03 c	48.49 c	45.76 c
500 kg / fad.	570.43 a	557.47 b	563.95 b	47.14 b	52.48 b	49.81 b
1000 kg/ fad.	588.04 a	588.60 a	588.32 a	49.44 a	54.43 a	51.93 a
F- test	**	**	**	**	**	**
Interactions:						
V x D	**	**	**	**	*	**
V x G	N.S	**	N.S	**	**	**
D x G	**	*	**	**	*	**
V x D x G	**	N.S	**	N.S	N.S	N.S

Table (3-a): Seed yield "kg/fad." and shelling percentage of peanut as affected by the interaction between peanut varieties and hill spaces "combined data".

Varieties	Hill spaces		
	25 cm	20 cm	15 cm
	Seed yield "kg/fad."		
	A	A	B
Giza "5"	517.34 b	447.75 c	323.05 c
	A	B	C
Giza "6"	636.99 a	536.17 bc	418.12 b
	A	A	B
Ismailia "1"	589.20 ab	559.33 b	449.11 ab
	B	A	C
Gerogorey	672.81 a	822.21 a	512.64 a
	Shelling percentage		
	A	B	B
Giza "5"	51.12a	45.89c	41.72b
	A	A	B
Giza "6"	52.41a	51.28ab	46.27b
	A	B	B
Ismailia "1"	52.19a	46.89bc	45.16b
	A	A	A
Gerogorey	50.98a	54.87a	51.24a

Table (3-b): Seed yield "kg/fad." and shelling percentage of peanut as affected by the interaction between hill spaces and gypsum treatments "combined data".

Hill spaces	Gypsum treatments		
	0.0 kg/fad.	500 kg/fad.	1000 kg/fad.
	Seed yield "kg/fad."		
	C	B	A
25 cm	515.58 a	628.01 a	668.67a
	B	A	A
20 cm	509.22 a	625.94 a	638.94 b
	B	A	A
15 cm	381.94 b	437.91 b	457.34 c
	Shelling percentage		
	C	B	A
25 cm	47.28a	52.10 a	55.64 a
	C	B	A
20 cm	46.45 a	50.38 b	52.36 b
	B	A	A
15 cm	43.54 b	46.94 c	47.81 c

Table (3-c): Shelling percentage of peanut as affected by the interaction between peanut varieties and gypsum treatments "combined data".

Varieties	Gypsum treatments		
	0.0 kg/fad.	500 kg/fad.	1000 kg/fad.
	C	B	A
Giza "5"	41.93 c	46.71 d	50.09 c
	C	B	A
Giza "6"	45.98 b	50.98 b	52.99 b
	B	A	A
Ismailia "1"	46.40 b	48.35 c	49.48 c
	C	B	A
Gerogorey	48.73 a	53.19 a	55.17 a

Table (4): Oil yield "kg/fad." and protein yields "kg/fad." of peanut as influenced by varietal differences, hill spacing and gypsum application during two growing seasons (2002 and 2003) and the combined.

Main effects and interactions	Oil yield "kg/fad."			Protein yield "kg/fad."		
	First season	Second season	Combined	First season	Second season	Combined
Varieties (V):						
Giza "5"	241.36 c	182.02 c	211.69 c	113.73 c	97.90 b	105.82 c
Giza "6"	292.62 b	231.96 b	262.29 b	137.34 b	119.93 b	128.64 b
Ismailia "1"	223.10 d	289.38 a	256.24 b	116.15 c	145.78 ab	130.97 b
Gerogorey	332.06 a	318.35 a	325.21 a	175.69 a	161.88 a	168.79 a
F- test	**	**	**	**	**	**
Hill spacing (D):						
25 cm between hills (84,000 plant/fad.)	312.70 a	298.76 a	305.73 a	147.80 a	143.06 a	145.43 a
20 cm between hills (105,000 plant/fad.)	299.05 a	275.35 b	287.20 b	148.12 a	140.53 a	144.32 a
15 cm between hills (140,000 plant/fad.)	205.11 b	192.18 c	198.65 c	111.26 b	110.54 b	110.90 b
F- test	**	**	**	**	**	**
Gypsum treatment (G):						
Without application	233.99 b	222.86 c	228.42 c	120.16 c	115.11 b	117.64 c
500 kg / fad.	286.89 a	256.92 b	271.91 b	140.31 b	134.19 a	137.25 b
1000 kg/ fad.	295.98 a	286.51 a	291.24 a	146.72 a	144.82 a	145.77 a
F- test	**	**	**	**	**	**
Interactions:						
V x D	**	**	**	**	*	**
V x G	N.S	N.S	N.S	N.S	N.S	*
D x G	**	N,.S	N.S	*	N.S	N.S
V x D x G	N.S	N.S	N.S	**	N.S	**

Table (4-a): Oil and protein yields "kg/fad." of peanut as affected by the interaction between peanut varieties and hill spaces "combined data".

Varieties	Hill spaces		
	25 cm	20 cm	15 cm
	Oil yield "kg/fad."		
	A	B	C
Giza "5"	261.29 b	220.73 c	153.04 c
	A	B	C
Giza "6"	327.31 a	264.28 b	195.28 b
	A	A	B
Ismailia "1"	285.56 b	278.95 b	204.21 ab
	A	A	B
Gerogorey	348.75 a	384.82 a	242.04 a
	Protein yield "kg/fad."		
	A	A	B
Giza "5"	124.84 c	112.09 c	80.51 c
	A	A	B
Giza "6"	150.87 ab	133.14 bc	101.89 bc
	A	A	A
Ismailia "1"	138.93 bc	135.58 b	118.38 b
	B	A	C
Gerogorey	167.06 a	196.48 a	142.82 a

Table (4-b): Protein yield "kg/fad." of peanut as affected by the interaction between peanut varieties and gypsum treatments "combined data".

Varieties	Gypsum treatments		
	0.0 kg/fad.	500 kg/fad.	1000 kg/fad.
	B	A	A
Giza "5"	86.43 c	115.58 c	115.43 c
	B	A	A
Giza "6"	114.42 b	132.35 b	139.14 b
	B	A	A
Ismailia "1"	115.13 b	137.16 b	140.42 b
	B	B	A
Gerogorey	154.38 a	163.89 a	188.09 a

بعض العوامل المؤثرة على إنتاجية الفول السودانى فى الأراضى الرملية حديثة الاستزراع

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قسم المحاصيل – كلية الزراعة – جامعة الزقازيق

أقيمت تجربتان حقليتان بمزرعة كلية الزراعة – جامعة الزقازيق بمنطقة الخطارة – محافظة الشرقية خلال موسمى ٢٠٠٢ و ٢٠٠٣ لدراسة تأثير المسافة بين الجور ٢٥ ، ٢٠ و ١٥سم (٨٤٠٠٠ ، ١٠٥٠٠٠ و ١٤٠٠٠٠نبات/فدان على الترتيب) وثلاثة معدلات من الجبس الزراعى (بدون إضافة ، ٥٠٠ و ١٠٠٠كجم/فدان) على إنتاجية أربعة أصناف من الفول السودانى (جيزة ٥ ، جيزة ٦ ، إسماعيلية ١ وجريجورى) تحت ظروف الأراضى الرملية، ويمكن تخليص أهم النتائج المتحصل عليها فيما يلى :

١- تفوق الصنف جريجورى على بقية الأصناف فى صفات وزن قرون وبذور النبات، وزن ١٠٠ بذرة، محصول القرون، البذور، الزيت والبروتين/فدان وكذلك نسبة التقشير.

٢- تفوقت الكثافة الأقل (٨٤٠٠٠ نبات /فدان) فى إنتاج أعلى وزن قرون، بذور /نبات، نسبة التقشير ، محصول الزيت / الفدان، وتم الحصول على أعلى قيمة لوزن ١٠٠ بذرة، محصول القرون، البذور والبروتين/الفدان عند الزراعة بأى من الكثافتين ٨٤٠٠٠ أو ١٠٥٠٠٠ نبات/ فدان مقارنة بالكثافة الأعلى (١٤٠٠٠٠نبات/فدان).

٣- أدت إضافة الجبس الزراعى بمعدل ٥٠٠كجم/فدان إلى إنتاج أعلى نسبة تقشير، محصول البذور، الزيت والبروتين /الفدان وتم الحصول على أعلى القيم لوزن ١٠٠ بذرة، وزن بذور النبات ومحصول القرون/الفدان عند إضافة أى من معدلى الجبس الزراعى (٥٠٠ و ١٠٠٠كجم/فدان).

٤- أظهرت نتائج تداخل الفعل المعنوى بين عوامل الدراسة ما يلى :
- تفوق الصنف جريجورى مع الكثافة النباتية المتوسطة (١٠٥٠٠٠ نبات/فدان) فى إنتاج أعلى محصول قرون، بذور وبروتين/الفدان.
- تفوق الصنف جريجورى مع مستوى الجبس الأعلى (١٠٠٠كجم/فدان) فى إنتاج أعلى محصول بروتين/الفدان وأعلى نسبة تقشير.
- تفوق الكثافة النباتية الأقل (٨٤٠٠٠ نبات/فدان) مع معدلى الجبس الزراعى (٥٠٠ و١٠٠٠كجم/فدان) فى إنتاج أعلى وزن قرون/نبات وأعلى نسبة تقشير.

٥- من خلال نتائج هذه الدراسة يمكن التوصية بزراعة صنف الفول السودانى جريجورى تحت ظروف الأراضى الرملية بمحافظة الشرقية بكثافة نباتية ١٠٥٠٠٠ نبات/ الفدان وبإضافة ٥٠٠كجم من الجبس الزراعى.