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EFFECT OF SOME AGRONOMIC TREATMENTS ON YIELD AND YIELD COMPONENTS OF PEANUT

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ABSTRACT: Four field experiments were carried out in the Experimental Farm, Faculty of Agriculture, Zagazig University at Khattara, Sharkia Governorate, Egypt during 2000 and 2001 seasons to study the effect of planting date, plant populations and potassium fertilization on yield and yield components of peanut (Giza 6 cv.).

Early planting significantly increase No. of pods / m^2, pod yield / fad and fodder yield/ fad . Otherwise, late planting produced heavier seeds and higher shelling %.

Mid-spacing of 20 cm between hills (84,000 plant/fad) appeared to produce the highest pod, seed and fodder yields/fad in addition to the heaviest seeds and the highest no. of pods/m^2 and shelling % as compared with either wider or closer spaces.

Application of 50kg K_2O/fad at planting gave the highest yield and components of peanut yield compared with other K-treatments applied.

INTRODUCTION

Peanut is one of the most important oil crops and food grain legume, it contain about 50% oil, 25-30% protein, 20% carohydrate and 5% fiber and ash and make a substantial contribution to human nutrition (Fageria *et al.* 1997). Peanut is a main summer crop in newly reclaimed sandy soils in Egypt. Production of oil crops in Egypt is insufficient for local consumption. So, it is of great importance to improve peanut production, which could be achieved by several agricultural practiceses, such as planting in a suitable date, plant density and fertilization.

Concerning a suitable planting date Abd El-Halem *et al.*, (1986)

reported that, early planting was always the superior one throughout yield and yield attributes studied. Also, Ali *et al.*, (1995) and Kalita *et al.* (2000) stated the superiority of peanut plants planted early from April 21 to the mid-May over those planted on June 7 in yield and yield attributes. In addition, Badran (2002) recorded significant decreases in number of pods / plant, seed index and seed yield / fad. due to delaying planting date.

Spacing between plants (plant density) of peanut grown in sandy soil required more study to determine the optimum spacing in order to get a maximum yield and decrease weed competition. Salem *et al.*, (1984) recorded significant increase in 100-seed weight and pod yied / fad with increasing peanut density from 23,333 to 45,000 and then to 70,000 plant/fad. Furthermore, Madkour *et al.*, (1992) and Basha (1994) recorded significant increases in 100-seed weight, pod and seed yields/fad of peanut due to raising its planting density from 70.000 to 84.000 plant /fad. and El-Seesy and Ashoub (1994) found gradual increases in 100-seed weight and shelling percentage with each widenning in hill spacing from 10 to 20 then 30 cm. But, in contrast, pod yield / fad was increased with each narrowing in hill spacing. However, Shams El-Din and Ali (1996) showed an increase in peanut pod yield due to narrowing hill spacing from 20 to 10 cm apart. Though, the opposite was the case for all yield components. Bell and Wright (1998) found an increase in number of pods/m^2 due to increasing peanut plant density. Moreover, El-Far and Ramadan (2000) found that hills spaced at 20 cm achieved the heaviest 100-seed weight and shelling percentage.

Regarding potassium fertilization, Deshmukh *et al.*, (1992) found that supplying peanut plants with 40 kg K_2O/ha. at planting could be maximized seed and haulm yield. Anton and Bassiem (1998) indicated that 100-seed weight and pod, and seed yields/ fad. of peanut were responded positively to application of potassium up to 48 kg / fad. . In addition, El-Far and Ramadan (2000) reported that the highest shelling percentage and pod yield of peanut could be obtained when received 36 kg K_2O/fad. in two equal doses at planting and 21 days after planting. Recently, Ali and Mowafy (2003) showed positive responses in 100-seed weight, pod and seed yields/fad and shelling percentage. So, the objectives of

this investigation were to study the effect of planting date, hill spacing (plant density) and K-fertilization on yield and its components of peanut grown in newly reclaimed sandy soil.

MATERIALS AND METHODS

Four field experiments were carried out in sandy soil of Agricultural Research Station of the Faculty of Agric., Zagazig University at Khattara during two growing seasons (2000 and 2001).

Compiling two experiments for each season, one for each planting date i.e. 8 May and 8 June.

A- Planting date (May 8 and June 8).

B- Hill spacing (Plant density):
- 1-25 cm between hills (67,200 plant / fad.).
- 2-20 cm between hills (84,000 plant / fad.)
- 3-15 cm between hills (112,000 plant / fad.)

C- Potassium fertilization:
- 1- Without K application.
- 2-25 kg K_2O/fad. at planting.
- 3-12.5 kg K_2O/fad at planting + 12.5 kg K_2O / fad. after 40 days.
- 4- 50 kg K_2O/fad. at planting.
- 5- 25 kg K_2O/fad. at planting + 25 kg K_2O / fad. after 40 days .

Each planting date experiment was laid out in a randomized complete block design with three replicates, the experiment included 15 treatments which were the combinations of three hill spacings and five treatments of potassium fertilizer. The area of the experimental unit was $9m^2$ (3x3m) included six rows 50 cm apart. Seeds were inoculated by Rhizobium Just before planting. Three to four peanut seeds were deposited in the hill, then plants were thinned to 2 plants / hill after two week from planting. The preceding crop was wheat in the two seasons. Nitrogen fertilizer in form of ammonium sulphate (20% N) and phosphorus fertilizer in form of calcium super phosphate (15.5% P_2O_5) were added before plantng at rate of 100 and 200 kg / fad, respectively. Also, gypsum as a source of calcium was added at rate of 500 kg / fad., in two equal doses before planting and with the onset – of the 1st flower. The soil of the experiments was sand in texture, it had an average pH value of 8.54 and organic matter content of 0.51%. The available N, P and K contents were 17.9, 11.3 and 82.0 ppm, respectively (averaged over the two seasons for the upper 30 cm of soil depth).

At harvest, the following characters were recorded on sample of 10 guarded plants taken from the 2nd inner two rows of each experimental unit. Whereas, Top, pod and seed yields were determinated using all plants in the centeral two rows with area of 3 m^2:

1- Number of pods/m^2.
2- Seed index (100-seed weight gm)
3- Pod yield (kg/fad).
4- Seed yield (kg/fad).
5- Shelling percentage.
6- Fodder yield (ton/fad.) which recorded just after harvest.

Each planting date as a separate experiment was analyzed according to Snedecor and Cochran (1967). Then, a combined analysis was made for both planting dates in each season, as well as, for the data of both seasons. Duncan 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 and 3) show the effect of planting date, hill spacing and K-fertilizer on yield, yield components of peanut.

1- Number of pods/m^2:

Concerning the effect of planting date (Table 1), the results indicated the superiority of early planting in this respect with highly significant differences in the first season and the combined, however, the differences could not reach the level of significance in the second season. The decrease in number of pods/m^2 due to delay planting was about 13.96 % as an average of both seasons. Yang *et al.* (1982) found that filled pods from early planting were higher than those of late planting. Also, Kasai *et al.*, (1999) showed that number of pods/m^2 was decreased with delay in planting date.

Regarding the effect of hill spacing, the results revealed highly significant differences during both seasons and the combined, whereas the mid-spacing of 20 cm appeared to produce the highest number of pods/m^2 followed by close spacing of 15 cm, while wide spacing of 25 cm gave the lowest number of pods /m^2. In other words, number of pods/m^2 were significantly decreased by widenning of spacing or decreasing planting density in spite of the higher yield attributes which

could not componsate the reduction occurred in plant population. These results are in accordance with those reported by Hussein *et al.*, (2000).

The results of K-fertilizer revealed highly significant differences, whereas application and splitting of k-fertilizer appeared to be increased number of pods/m^2. Therefore, splitted 50 kg K_2O/fad. produced the highest number of pods/m^2 which followed by splitted 25 kg compared with other K-treatments. The lowest number of pods/m^2 was given by without K-fertilizer application. These results could be discussed according to the finding of Giller (1964), who found that the highest level of K in plants produced the most flowers and pods. Also, the obtained results are in agreement with those reported by Saha *et al.* (1994).

The significant interaction between planting date and K-fertilization on number of pods/m^2 Table (1-a) indicate that early planting produced higher pods/m^2 with different K-treatments except with splitted 50 kg where no significant difference was observed between both planting dates. On the other side, increasing and splitting K-fertilizer appeared to produce more pods under both planting dates. Thus, the lowest pods/m^2 was given by delay planting when no k-fertilizer was added.

With respect to the significant interaction between hill spaces and K-fertilizer (Table 1-b) application and splitting K-fertilizer appeared to produce more pods/m^2 with different hill spaces. On the other direction, mid-spacing of 20 cm produced higher pods/m^2 under different K-treatments. Thus, the highest number of pods/m^2 (188.58) was achieved by splitted 50 kg K_2O/fad. application when mid-spacing of 20 cm was used.

2-Seed index (100-seed weight gm):

The results in Table (1) regarding planting date revealed highly significant differences whereas the late planting of June produced heavier seeds than early planting. These results indicated a reverse direction with those of number of pods/m^2 in this respect. Such superiority of late planting in producing heavier seeds may be attributed mainly to lower number of pods/plant or /m^2 and seeds / pod given by late planting compared with early one. In other words peanut plants showed a considerable increment in seed weight with delay in planting reached around 7.10 gm / 100-seeds (10.38%) when planting

delayed from May 8 to June 8, concerning the combined data. Ali *et al.*, (1994) stated that the differences between May 15 and June 7 planting did not reach the level of significance, regarding 100-seed weight of Giza-5 cultivar.

Likely, hill spacing results showed highly significant differences, whereas mid-spacing of 20 cm appeared to produce the heaviest seeds compared with either wide or close spaces. However, close spacing of 15 cm produced the lightest seeds during first season and the combined but the reverse was observed during the second season when the lightest seeds were given by wide spacing of 25 cm. In this connection, El-Far and Ramadan (2000) stated that hills spaced at 20 cm recorded the heaviest seeds of peanut compared with either wide or close spaces. Also, Hussein *et al.*, (2000) reported that 100-seed weight of peanut was significantly increased by reducing plant density.

With respect to influence of K-fertilization, the results revealed highly significant differences, whereas the application of K-fertilization at planting tended to produce heavier seeds either with low rate during the first season or with high rate during the second one. Therefore, the combined results showed that heavier seeds were produced by once application of 25 and 50 kg K_2O/fad. compared with splitting or without adding K- applications. These results are in a good line with those reported by Anton and Bassiem (1998) and Ali and Mowafy (2003) who reported that 100-seed of peanut responded positively to application of potassium from 25 up to 72 kg K_2O/fad.

Regarding the significant interaction between the studied factors on 100-seed weight, the interaction between planting dates and hill spacing (Table 1-c) showed that late planting produced heavier seeds with different hill spaces and mid-spacing of 20 cm produced heavier seeds with both planting dates. Thus, the heaviest 100-seed weight of 72.21 gm was achieved by late planting when mid-spacing of 20 cm was applied.

Likely, the significant interaction between planting date and K-fertilization (Table 1-a) showed that late planting produced heavier seeds with different K-fertilization treatments. Once application of K-fertilizer appeared to produce heavier seeds with early planting, while splitted 25 and

once application of 50 kg K_2O/fad gave heavier seeds with late planting.

In addition, the interaction between hill spacing and K-fertilization (Table 1-b) indicated that mid-spacing of 20 cm produced heavier seeds with different K-treatments. On the other side once application of 50 kg K_2O / fad appeared to produce heavier seeds with mid and close hill spaces. Then, the heaviest 100-seed weight (70.00 gm) was achieved by mid-spacing of 20 cm when once application of 50 kg K_2O / fad was applied.

3- Pod yield (kg/fad.):

Data presented in Table (2) revealed highly significant differences, whereas early planting produced higher pod yield/ fad. compared with late planting. The early planting outyielded late one by around 126.50 kg / fad. (14.72 %), regarding the combined data. The obtained results are in typical agreement with those reported by Kasai *et al.*, (1999) and Hazarika *et al.* (2000).

Regarding the effect of hill spacing on pod yield, the results revealed highly significant differences where the mid-spacing of 20 cm produced the highest pod yield / fad followed by close spacing of 15cm, while wide spacing of 25 cm gave lower pod yield/fad. In other words, the mid-spacing of 20 or 84,000 plant/fad. appeared to be better density as compared with either lower density of 67,200 or higher density of 112,000 plant / fad. These results are in accordance with those reported by Shams El-Din and Ali (1996) and El-Far and Ramadan (2000).

Likely, potassium fertilization results revealed highly significant differences, whereas the application of K-fertilizer exerted a marked effect on pod yield / fad. In addition, there was a progressive and consistent increase in pod yield/fad. by adding and increasing K-level up to 50 kg K_2O/fad. during second season and the combined. However, increasing K-level had no significant effect on pod yield / fad. during the first season. It could be conclude that pod yield / fad. of peanut responded favourable to potassium fertilization up to 50 kg K_2O/fad. according to the results of this investigation. Several investigators came to the same conclusion include Saha *et al.* (1994), El-Far and Ramadan (2000) and Ali and Mowafy (2003).

With respecting to the significant interactions between

the studied factors on pod yield / fad., the results indicated the superiority of early planting either with different hill spaces (Table 2-a) or under various K-treatments (Table 2-b) in this respect. On the other direction, mid-spacing of 20 cm appeared to produce higher pod yield with both planting dates, thus, the highest pod yield of 925.77 kg/fad was achieved by early planting with mid-spacing. Also, application and increasing K-level tended to be increased pod yield with both planting dates (Table 2-b). Therefore, the highest pod weight of 957.23 kg/fad was obtained by early planting when once application of 50 kg K_2O / fad was applied.

In addition, the interaction effects between hill spaces and K-treatments (Table 2-c) showed that mid-space produced higher pod yield / fad with various K-treatments. Also, application and increasing K-level appeared to produce higher pods/fad under different hill spaces. Then, the highest pods yield of 988.90 was achieved by mid – space of 20 cm when splitted 50 kg K_2O/fad was applied.

4- Seed yield (kg/fad.):

The data in Table (2) show the effect of planting date, hill spacing and K-fertilization on seed yield / fad. during both growing seasons and the combined.

The results indicate insignificant differences between planting dates during both seasons and the combined as well in spite of the superiority of early planting in growth and most yield attributes. Such results might be attributed to superiority of late planting in producing heavier seeds (Table 1) resulted from lower pod/plant and seeds/pod which in turn may compensate that reduction occurred during late planting in pod yield / fad. Then, no significant effects could be detected between early and late planting in seed yield/fad. In this connection, Kalita *et al.* (2000) indicated that delaying planting date followed with a favourable effect on peanut yield.

Concerning, the influence of hill spacing on seed yield / fad., the results in the same Table (2) revealed highly significant differences during the two seasons and the combined where the middle density of 84,000 plant / fad. appeared to produce the highest seed yield / fad. throughout the seasons and the combined compared with both light density of 67,200 plant/fad or dense density of 112,000 plant/ fad. In

addition, seed yield/fad in both seasons and the combined were significantly declined by decreasing plant density or widenning spacing of 25 cm in spite of the higher values of yield attributes which could not compensate the reduction occurred in plant population/ fad. In this manner, Hanna *et al.* (1994) showed a significant increase in seed yield/fad. due to decreasing number of peanut plants/fad. Also, Madkour *et al.* (1992) reported that seed yield / fad. increased by increasing plant population up to 84,000 plant/fad. In addition, the obtained results are in accordance with those reported by Basha (1994) and Lukunchuon *et al.*, (1997).

Regarding the effect of K-fertilization on seed yield/fad., the results revealed highly significant differences, whereas high level of 50 kg K_2O/fad. applied at planting appeared to be produced higher seed yields during both seasons and the highest in the combined compared with other K-treatments. In other words application and increasing K-fertilizer up to 50 kg K_2O/fad. tended to improve seed yield of peanut. Once application of 50 kg K_2O / fad. outyielded without K-application, 25 kg once application and splitted 25 kg K_2O / fad. by around 22.48, 15.59 and 6.95% in the same followed order, concerning the combined data. Anton and Bassiem (1998) and Darwish *et al* (2002) stated that application of K at rate of 48 kg K_2O/fad. gave the highest seed yield / fad.

The significant interaction effects between the studied factors on seed yield / fad. are presented in Tables (2-a, b and c). Meanwhile, the significant interaction between planting date and hill spacing indicate that late planting produced higher seed yield/fad. with wide and mid spaces of 25 and 20cm, while the highest seed yield of 502.33 kg/fad. was obtained by early planting when mid spacing of 20 cm was applied

The significant interaction between planting date and K-fertilization on seed yield/fad. indicate that late planting tended to produce higher seed yield with most K-treatments. However, the highest seed yield of 504.17 was achieved by early planting when once application of 50 kg K_2O/fad. was applied.

In addition, the interaction effects between hill spaces and K-fertilization on seed yield showed that mid-spacing of 20 cm tended to produce higher seed yield with

different K-treatments. Therefore, higher seed yields / fad. were obtained by mid-spacing when high rate of K-fertilizer was applied either once or splitted application. However, close spacing of 15 cm gave higher seed yield / fad when once application of 50 kg K_2O / fad was applied.

5- Shelling percentage:

Shelling percentage which counted by divided seeds yield on pods yield as percentage is shown in Table (3).

Regarding the influence of planting date, the results revealed highly significant differences and followed the same pattern of 100-seed weight, whereas the late planting of June gave higher shelling percentage as compared with early planting. The superiority of late planting in shelling percentage amounted to 14.23% compared to early planting. In this connection, Ali *et al.*, (1995) reported that early planting of April 21 gave the highest shelling percentage following by middle planting date of May 15, while the late planting of June 7 gave the lowest shelling percentage.

Concerning the effect of hill spacing, no significant differences could be detected during both seasons and the combined in this respect. However, mid-spacing tended to record higher shelling percentage during first season and the combined. Salem *et al.*, (1984) indicated that shelling percentage was decreased with each increase in planting density. Also, El-Seesy and Ashoub (1994) showed a gradual increase in shelling percentage with each widenning in hill spacing from 10 to 20 and up to 30 cm a part.

Potassium fertilization showed highly significant differences during first season and the combined, whereas splitted and once application of 25 Kg K_2O/fad recorded higher shelling percentage as compared with other K-treatments. However, the differences could not reach the level of significance in the second season. Several investigators showed increment of shelling percentage due to application and increasing K-fertilizer levels of them Pal *et al.* (1996), El-Far and Ramadan (2000) and Ali and Mowafy (2003).

Furthermore, the significant interaction between hill spacing and K-fertilization Table (3-a) indicated that dense planting tended to gave higher shelling percentage with application of 25

and 50 kg K_2O/fad at planting. Also, the once application of 50 kg K_2O / fad. gave higher shelling percentage with wide spacing of 25 cm.

6- Fodder yield (Ton/fad.):

The fodder yield results Table (3) indicated highly significant differences in the two seasons and the combined, whereas early planting of May appeared to produce higher fodder yield as compared with late planting. Meanwhile, early planting outyileded the late one by around 770kg / fad. (33.48%), regarding combined data. The obtained results are in accordance with those reported by Ali *et al.* (1994).

Regarding the influence of hill spaces on fodder yield of peanut, the results revealed highly significant differences throughout the seasons and the combined. Generally, the results followed the same patterns of pods number/m^2, 100-seed weight and pod and seed yields/fad. where mid-space of 20 cm appeared to produce the highest fodder yield / fad followed by wide spacing of 25 cm. However, dense planting of 15 cm spacing produced the lowest fodder yield/fad through the seasons and the combined compared with mid and wide spaces. In this connection, Patra *et al.*, (1998) cleared that crowding within rows of peanut caused sever competition for nutrients, solar energy and space for pegging mutual shadding also reduced net photosynthetic.

The results in the same Table (3) indicated highly significant effects for K-fertilization on fodder yield of peanut in both seasons and the combined. In general, increasing K-fertilizer level up to 50 kg K_2O/fad. with application at planting appeared to produce higher fodder yield compared with other K-treatments. The obtained results are in agreement with those reported by Anton and Bassiem (1998), and Ali and Mowafy (2003).

The significant interactions between the studied factors on fodder yield / fad. are presented in Tables (3-a, b, and c). Meanthrough, the interaction effects between planting dates and hill spaces followed the same main effect trends whereas early planting appeared to produce higher fodder yield with different hill spaces.

Likely, the significant interaction between planting dates and K-fertilization on fodder yield/ fad showed the superiority of early

planting and once application of 50 kg K_2O/fad. on both directions.

Finally, the significant interaction between hill spaces and K-fertilization indicated the superiority of mid-spacing of 20 cm with various K-treatments in this respect. On the other side, once application of 50 Kg K_2O/fad appeared to produce higher fodder yield with different hill spaces. Therefore, the highest fodder yield of 2.90 ton / fad. was obtained by mid – spacing of 20 cm when 50 kg K_2O / fad. was applied at planting.

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REFERENCES

Abd El-Hallem, A.K.; A.M. Selim and H.A. El-Zeiny (1986): Growth and yield response of peanut plant to sowing date and irrigation treatments. Egypt. J. Agron. 11:35-43.

Ali, A.A.G.; E.H. Fayed; H.A. Basha and A.M. Hassan (1994): Response of peanut to some agricultural practices. 1- Influence of sowing dates and application of phosphorus and gypsum on growth of peanut plants. Zagazig J. Agric. Res. 21 : 1645-1658

Ali, A.A.G.; E.H. Fayed; H.A. Basha and A.M. Hassan (1995): Response of peanut to some agricultural practices. III- influence of sowing dates and application of phosphorus and gypsum on quality of peanut. Zagazig J. Agric. Res. 22:349-366.

Ali, A.A.G. and S.A.E. Mowafy (2003): Effect of different levels of potassium and phosphorus fertilizers with the foliar application of zinc and boron on peanut in sandy soils. Zagazig J. Agric. Res., Vol. 30 No. (2): 335-358.

Anton, N.A. and M.M. Bassiem (1998): Effect of phosphorus and potassium fertilizers and foliar spray with ascorbic and citric acids on peanut plant under sandy soil conditions. Zagazig J. Agric. Res. 25 (5): 733 – 742.

Badran, M.S.S. (2002): Solid versus intercropping sesame

with groundnut yield and yield components. Minufiya J. Agric. Res. Vol. 27 No. 6: 1349-1361.

Basha, H.A. (1994): Response of some groundnut cultivars to different planting space in newly cultivated sandy soil. Zagazig J. Agric. Res. Vol. 21 (3A) 655 – 670.

Bell, M.J. and G.C. Wright (1998): Groundnut growth and development in contrasting environments: 1- Growth and plant density response. Experimental Agric. Jan; 34 (1) 99-112. (C.F. computer research).

Darwish, D.S.; El.-G.A.; El-Gharreib; M.A. El-Hawary and O.A. Raffat (2002): Effect of some macro and micronutrients application on peanut production in a saline soil in El-Faiyum governorate. Egypt. J., Appl. Sci., 17 (4), 17-32.

Deshmukh, V.N.; R.T. Warokar and B.T. Kanakpure (1992): Yield quality and nutrient uptake by groundnut as influenced by potash fertilization and time of application. J. of potassium Res., 8 (4) 367-370.

Duncan, B.D. (1955): Multiple range and Multiple F.test Biometries, (II): 1-24.

El-Far, I.A. and B.R. Ramadan (2000): Response of yield, yield components and seed quality of peanut *(Arachis hypogaea* L.) to plant density and P, K fertilization in sandy calcareus soil. Proc. 9th Conf. Agron. Minufiya Univ., 1-2: 453-466.

El-Seesy, M.A. and H.A. Ashoub (1994): Productivity of groundnut *((Arachis hypogaea* L.) as affected by different population and nitrogen levels. Annals of Agric. Sci. Moshtohor, Vol. 32 (3): 1199-1221.

Fageria, N.K.; V.C. Baligar and C.A. Jones (1997): Growth and mineral nutrition of field crops. 2nd Edition. Marcel Dekker. Inc, New York 1001kg page, 494.

Giller, P. (1964): The amount of minero elements removed by a groundnut crop in different zones of Senegal (Field crop Abst.) 19 (178) 1967.

Hanna, F.R.; F. Salama and Abd-El-Gawad (1994): Effect of population density on yield of peanut *(Arachis hypogaea* L.) Annals of Agric. Sci. Moshtohor, Vol. 32 (2): 731-742.

Hazarika, D.K.; L.N. Dubey and K.K. Das (2000): Effect of sowing dates and weather

factors on development of leaf spots and rust of groundnut. Journal of mycology and plant pathology 30, 1, 27.30, 10 ref (C.F. computer research).

Hussein, S.M.A.; A.M. El-Melegy and M.A. Haikel (2000): Effect of nitrogen frequency, gypsum application, plant density and their interaction on growth and yield of peanut under drip irrigation system in North Sinai. J. Agric. Sci. Mansoura Univ., 25 (5): 2427-2438.

Kalita, V.; J. Suhrawardy and M. Hussain (2000): Effect of variety, fertilizer and sowing dates on growth and yield of Kharif groundnut *(Arachis hypogaea* L.) under rainfed upland situations. Annals of Agric. Bio. Research, 5:2, 141 – 143, 3 ref. (C.F. computer research).

Kasai, F.S.; E.M. Paulo; I.J. Godoy and V. Nagai (1999): Influence of sowing time on growth, productivity and other yield characters of groundnut cultivars in the Alta paulista region, State of Saopaulo, Brazil. Bragantia, 58 : 1, 95-107, 16 ref. (C.F. computer research).

Lukunchuan, Y. Maushing; Y. Kinshing and L. Hungshung (1997): Effect of genotype, population density and harvest date on yield and quality of peanut. Journal of Agric. Research of China. 46 (2) 116-131 (C.F. computer research).

Madkour, M.M.; S. El-Mohandes and A.M. El-Wakil (1992): Effect of row spacing, phosphorus, potassium and boron application on some peanut cultivars. Egypt, J. Agron. 17, No. 1-2, pp. 127-140.

Pal, T.; G. Sounda; D. Dutta and P.K. Panda (1996): Residual effect of phosphorus and potassium on yield attributes, yield and oil content of groundnut *(Arachis hypogaea* L.) Environment and ecology 14 : (4) 883-885 (En, 6 ref.) (C.F. computer research).

Patra, A.K.; S.K. Tripathy; R.C. Samui; P.K. Panda and M.K. Nanda (1998): Effect of sowing date, irrigation and spacing on nutrient content and uptake by groundnut *(Arachis hypogaea* L.) Indian J. of Agronomy 43 (3): 459 – 463.

Saha, B.C.; A.K. Singharoy and B.K. Mandal (1994): Effect of split application of potassium on yield and yield components of summer groundnut in acid

terai soil of North Bengal. J. of potassium Res. 10 (1): 73-77. (C.F. Field Crop Abst. 1995, Vol. 48, No 6, 4329).

Salem, M.S.; M. Serry and M.M. Soliman (1984): Plant density-yield relation in peanut *(Arachis hypogaea* L.) Annals Agric. Sci., fac. Agric., Ain-Shams Univ., Cairo, Egypt. 29 (1), 203-212.

Shams El-Din, G.M. and E.A. Ali (1996): Upgrading productivity of two peanut *(Arachis hypogaea* L.) varieties through applying optimum plant spacing and micronutrients application. Arab Univ. J. Agric. Sci., Ain Shams Univ., Cairo 4 (1, 2) : 53 – 67.

Snedecor, G.W. and Cochran (1967): Statistical methods. 6th ed. The Iowa State Univ. Press, Ames, USA.

Yang, W.S.; J.Y. Shen; Z.Z. Shi; G. Lno; H. Yang and R.R. Xiso (1982): A study on different sowing dates of spring groundnut. Guangdong Agric. Aci., 5 : 33-34. (F.C. Field Crop Abst. 37 (1), 290, 1984).

Table (1): Number of pods /m^2 and 100 seed weight (gm) as influenced by planting date, hill spacing and potassium fertilization in the two seasons and their combined.

Treatments and Interaction	Number of pods/m^2			100 –seed weight (gm)		
	2000	2001	Com-bined	2000	2001	Com-bined
Planting date (P):						
May 8	178.68a	151.17	164.93a	61.78b	60.85b	61.31b
June 8	133.38b	150.44	141.91b	72.18a	64.65a	68.41a
F. test	**	N.S	**	**	**	**
Hill spacing (D)						
25 cm between hills (67.200 plant / fad.)	132.82c	137.23b	135.02c	67.59b	60.50c	64.05b
20 cm between hills (84.000 plant/fad)	175.72a	172.61a	174.17a	70.71a	65.35a	68.03a
15 cm between hills (112, 000 plant / fad.)	159.56b	142.57b	151.06b	62.63c	62.38b	62.51c
F. test.	**	**	**	**	**	**
Potassium fert. (K): (Kg K_2O/fad.)						
Without K application	144.51b	128.82d	136.66d	63.26d	61.82b	62.54c
25 at planting	169.73a	131.11d	150.42bc	69.75a	62.82b	66.29a
12.5 at panting + 12.5 after 40 days	174.12a	145.04c	159.58b	68.78ab	60.04c	64.41b
50 at planting	139.94b	159.06b	149.49c	67.05bc	67.29a	67.17a
25 at planting + 25 after 40 days	151.87b	189.99a	170.94a	66.05c	61.75b	63.89b
F. test.	**	**	**	**	**	**
Interaction						
P x D	N.S	N.S	N.S	**	N.S	**
P X K	N.S	**	**	**	**	**
D x K	**	**	**	**	**	**

*, ** and N.S. indicate significant at 0.05, 0.01 and insignificant, respectively.

Table (1-a): Number of pods/m^2 and 100-seed weight (gm) as affected by the interaction between planting date and potassium fertilization (combined data).

Planting Date	Potassium fertilization (kg K_2O/fad.)				
	0.0	25 at planting	12.5 at planting + 12.5 after 40 days	50 at planting	25 at planting + 25 after 40 days
	Number of pods / m^2				
May 8	AB 160.38a	B 158.60a	A 171.95a	AB 161.92a	A 171.78a
June 8	C 112.94b	B 142.24b	B 147.21b	B 137.07b	A 170.09a
	100-Seed weight (gm)				
May 8	B 60.42b	A 64.07b	C 57.68b	A 63.22b	B 61.18b
June 8	D 64.67a	B 68.50a	A 71.15a	A 71.12a	C 66.62a

Table (1-b): Number of pods/m^2 and 100-seed weight (gm) as affected by the interaction between hill spacing and potassium fertilization (combined data).

Hill Spacing	Potassium fertilization (kg K_2O / fad.)				
	0.0	25 at planting	12.5 at planting + 12.5 after 40 days	50 at planting	25 at planting + 25 after 40 days
	Number of pods/m^2				
25cm	B 126.08b	B 123.58c	A 147.70b	B 114.78b	A 163.00b
20 cm	C 159.16a	BC 170.81a	AB 186.61a	C 165.67a	A 188.58a
15 cm	C 124.75b	AB 156.88b	B 144.42b	A 168.05a	A 161.22b
	100-Seed weight (gm)				
25cm	B 62.63b	A 64.82b	A 64.93b	B 62.28b	A 65.59b
20 cm	B 67.05a	B 67.64a	B 67.70a	A 70.00a	B 67.77a
15 cm	D 57.95c	B 66.40ab	C 60.62c	A 69.23a	D 58.33c

Table (1-c): 100-Seed weight (gm) as affected by the interaction between planting date and hill spacing (combined data).

Planting date	Hill spacing		
	25 cm	20cm	15cm
May 8	C 59.08b	A 63.85b	B 61.00b
June 8	B 69.02a	A 72.21a	C 64.01a

Table (2): Pod yield (kg/fad) and seed yield (kg/fad) as influenced by planting date, hill spacing and potassium fertilization in the two seasons and their combined.

Treatments and Interaction	Pod yield (kg/fad.)			Seed yield (kg/fad.)		
	2000	2001	Com-bined	2000	2001	Com-bined
Planting date (P):						
May 8	1060.26a	658.07a	859.16a	502.28	372.06	437.17
June 8	835.68b	629.63b	732.66b	491.56	386.59	439.08
F. test	**	**	**	N.S.	N.S	N.S
Hill spacing (D)						
25 cm between hills (67.200 plant / fad.)	871.23b	604.19b	737.71c	451.36b	353.28b	402.32b
20 cm between hills (84.000 plant/fad)	1064.94a	709.79a	887.37a	573.83a	415.41a	494.62a
15 cm between hills (112, 000 plant/ fad.)	907.75b	617.56b	762.66b	465.57b	369.29b	417.43b
F. test.	**	**	**	**	**	**
Potassium fert. (K): (Kg K_2O/fad.)						
Without K application	873.18b	564.69c	718.93c	436.41c	323.88d	380.14d
25 at planting	964.79a	595.86bc	780.33b	477.97b	349.85cd	413.91c
12.5 at panting + 12.5 after 40 days	959.00a	630.33b	794.67b	536.59a	376.05bc	456.32b
50 at planting	980.83a	715.27a	848.05a	541.84a	438.93a	490.38a
25 at planting + 25 after 40 days	962.07a	713.09a	837.58a	491.80b	407.94ab	449.87b
F. test.	**	**	**	**	**	**
Interaction						
P x D	**	**	**	**	**	**
P X K	**	**	**	**	**	*
D x K	**	**	**	**	**	**

*, ** and N.S. indicate significant at 0.05, 0.01 and insignificant, respectively.

Table (2-a): Pod yield (kg/fad.) and seed yield (kg/fad.) as affected by the interaction between planting date and hill spacing (combined data).

Planting date	Hill spacing		
	25 cm	20cm	15cm
	Pod yield (kg/fad.)		
	C	A	B
May 8	754.87a	925.77a	822.12a
	B	A	C
June 8	720.55a	815.63b	661.79b
	Seed yield (kg/fad.)		
	C	A	B
May 8	368.14b	502.33a	441.02a
	B	A	C
June 8	436.50a	486.91a	393.84b

Table (2-b): Pod yield (kg/fad.) and seed yield (kg/fad.) as affected by the interaction between planting date and potassium fertilization (combined data).

Planting date	Potassium fertilization (kg K_2O/fad.)				
	0.0	25 at planting	12.5 at planting + 12.5 after 40 days	50 at planting	25 at planting + 25 after 40 days
	Pod yield (kg/fad.)				
	C	C	BC	A	AB
May 8	736.05a	782.12a	821.10a	957.23a	874.78a
	C	BC	AB	AB	A
June 8	646.26a	709.54a	768.24a	738.87b	800.38a
	Seed yield (kg/fad.)				
	D	CD	B	A	BC
May 8	391.70a	408.37a	441.82a	504.17a	439.79a
	C	B	A	A	A
June 8	368.58a	419.45a	470.82a	476.60a	459.95a

Table (3): Shelling percentage and fodder yield (ton/fad) as influenced by planting date, hill spacing and potassium fertilization in the two seasons and their combined.

Treatments and Interaction	Shelling percentage			Fodder yield (ton / fad).		
	2000	2001	Com-bined	2000	2001	Com-bined.
Planting date (P):						
May 8	47.19b	56.36b	51.77b	2.64a	1.96a	2.30a
June 8	59.32a	61.52a	60.42a	1.55b	1.51b	1.53b
F. test	**	**	**	**	**	**
Hill spacing (D)						
25 cm between hills (67.200 plant / fad.)	53.39	58.39	55.89	1.99b	1.59b	1.79b
20 cm between hills (84.000 plant/fad)	54.62	58.49	56.55	2.59a	2.14a	2.36a
15 cm between hills (112, 000 plant/ fad.)	51.75	59.94	55.84	1.71c	1.49c	1.59c
F. test.	N.S	N.S	N.S	**	**	**
Potassium fert. (K): (Kg K_2O/fad.)						
Without K application	50.09b	57.39	53.75b	1.80d	1.27d	1.54c
25 at planting	50.29b	58.94	54.61b	2.19b	1.58c	1.88b
12.5 at panting + 12.5 after 40 days	56.02a	59.72	57.87a	1.97cd	1.74b	1.85 b
50 at planting	57.72a	61.58	59.65a	2.52a	2.28a	2.40a
25 at planting + 25 after 40 days	52.15b	57.05	54.60b	1.99c	1.81b	1.90b
F. test.	**	N.S	**	**	**	**
Interaction						
P x D	**	N.S	N.S	**	N.S	**
P X K	**	N.S	N.S	**	**	**
D x K	**	**	**	N.S	**	**

*, ** and N.S. indicate significant at 0.05, 0.01 and insignificant, respectively.

Table (2-c): Pod yield (kg/fad.) and seed yield (kg/fad.) as affected by the interaction between hill spacing and potassium fertilization (combined data).

Hill spacing	Potassium fertilization (kg K_2O / fad.)				
	0.0	25 at planting	12.5 at planting + 12.5 after 40 days	50 at planting	25 at planting + 25 after 40 days
	Pod yield (kg/fad.)				
	A	A	A	A	A
25cm	703.56a	702.76a	775.99ab	733.84b	772.41b
	C	BC	BC	AB	A
20 cm	773.98a	812.79a	861.70a	916.13a	988.90a
	C	B	B	A	B
15 cm	595.92b	721.93a	746.31b	894.18a	751.44b
	Seed yield (kg/fad.)				
	BC	C	A	AB	AB
25cm	383.84b	347.46b	444.39b	418.49b	417.43b
	B	C	AB	A	A
20 cm	480.46a	428.36a	511.24a	525.21a	527.84a
	D	B	C	A	C
15 cm	276.12c	465.91a	413.33b	527.46a	404.34b

Table (3-a): Shelling percentage and fodder yield (ton/fad.) as affected by the interaction between hill spacing and potassium fertilization (combined data).

Hill spacing	Potassium fertilization (kg K_2O / fad.)				
	0.0	25 at planting	12.5 at planting + 12.5 after 40 days	50 at planting	25 at planting + 25 after 40 days
	Shelling percentage				
	B	C	AB	A	BC
25cm	55.47a	50.57b	57.77a	60.96a	54.71a
	AB	C	A	ABC	BC
20 cm	57.72a	52.91b	59.74a	57.56a	54.85a
	C	A	AB	A	B
15 cm	48.06b	60.38a	56.10a	60.43a	54.26a
	Fodder yield (ton/fad.)				
	C	B	B	A	B
25cm	1.30b	1.79b	1.78b	2.22b	1.84b
	B	B	B	A	B
20 cm	2.15a	2.28a	2.27a	2.90a	2.21a
	C	B	B	A	B
15 cm	1.17c	1.58c	1.50c	2.07b	1.67 c

Table (3-b): Fodder yield (ton/fad.) as affected by the interaction between planting date and hill spacing (combined data).

Planting date	Hill spacing		
	25 cm	20cm	15cm
	B	A	C
May 8	2.13a	2.94a	1.84a
	B	A	B
June 8	1.44b	1.78b	1.36b

Table (3-c): Fodder yield (ton/fad.) as affected by the interaction between planting date and potassium fertilization (combined data).

Planting date	Potassium fertilization (kg K_2O/fad.)				
	0.0	25 at planting	12.5 at planting + 12.5 after 40 days	50 at planting	25 at planting + 25 after 40 days
	D	B	C	A	BC
May 8	1.80a	2.35a	2.20a	2.89a	2.26a
	C	B	B	A	B
June 8	1.27b	1.42b	1.50b	1.90b	1.55b

تأثير بعض المعاملات الزراعية على المحصول ومكوناته فى الفول السودانى

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أسماء عبد السلام خميس

قسم المحاصيل – كلية الزراعة – جامعة الزقازيق

أقيمت أربع تجارب حقلية بمزرعة كلية الزراعة – جامعة الزقازق بمنطقة الخطارة – محافظة الشرقية خلال موسمى ٢٠٠٠، ٢٠٠١ لدراسة تأثير مواعيد الزراعة (٨ مايو، ٨ يونيه) والكثافة النباتية (٦٧,٢٠٠، ٨٤,٠٠٠، ١١٢,٠٠٠ نبات/فدان) والتسميد البوتاسى [بدون إضافة، ٢٥ كجم بو٢أ/فدان عند الزراعة، ٢٥ كجم بو ٢أ/ف تجزئ (١٢,٥ عند الزراعة + ١٢,٥ بعد ٤٠ يوم من الزراعة، ٥٠كجم بو٢أ /ف عند الزراعة، ٥٠كجم بو٢أ / ف تجزئ (٢٥ عند الزراعة + ٢٥ بعد ٤٠ يوم من الزرعة)] على المحصول ومكوناته لصنف الفول السودانى جيزة ٦ تحت ظروف الأراضى الرملية ويمكن تلخيص أهم النتائج فيما يلى:

١- تفوق ميعاد الزراعة المبكر معنويا على ميعاد الزراعة المتأخر فى صفات عدد القرون/م٢، محصول القرون/فدان ومحصول العرش/فدان بينما أعطى الميعاد المتأخر أعلى وزن ١٠٠ بذرة ونسبة تقشير وذلك خلال موسمى الزراعة.

٢- تفوقت الكثافة المتوسطة (٨٤,٠٠٠ نبات / فدان المتحصل عليها من الزراعة على ٢٠ × ٥٠سم) فى جميع الصفات تحت الدراسة حيث أعطت أعلى محصول قرون، بذور، وعرش / فدان كذلك أعلى عدد قرون / م٢، وزن ١٠٠ بذرة ونسبة تقشير مقارنة بالكثافة الأقل والأعلى (٦٧,٢٠٠، ١١٢,٠٠٠ نبات/فدان).

٣- أدت إضافة السماد البوتاسى بمعدل ٥٠كجم بو٢أ/ف عند الزراعة لزيادة جميع الصفات تحت الدراسة مقارنة بالمعاملات الأخرى.

٤- أظهرت نتائج تداخل الفعل المعنوى بين مواعيد الزراعة والكثافة النباتية تفوق ميعادى الزراعة مع الكثافة المتوسطة (٨٤,٠٠٠ نبات/فدان) فى إنتاج أعلى معدلات من وزن ١٠٠ بذرة، محصول القرون، محصول البذور ومحصول العرش/ف.

كذلك أظهرت نتائج تداخل الفعل المعنوى بين مواعيد الزراعة ومستويات التسميد البوتاسى تفوق كلا الميعادين مع مستوى التسميد البوتاسى ٥٠ كجم بو٢أ / ف المضافة عند الزراعة فى إنتاج أعلى وزن ١٠٠ بذرة، محصول قرون، محصول بذرة ومحصول عرش / فدان.

٥- أظهرت نتائج تداخل الفعل المعنوى بين الكثافة النباتية ومستويات التسميد البوتاسى تفوق الكثافة النباتية (٨٤,٠٠٠ نبات / ف) مع مستوى التسميد البوتاسى ٥٠ كجم بو٢أ/ف المضافة عند الزراعة فى إنتاج أعلى معدل من وزن ١٠٠ بذرة، محصول القرون، محصول البذور، ونسبة التقشير ومحصول العرش/ف.