RESPONSE OF GROUND NUT *(ARACHIS HYPOGAEA, L.)* TO DIFFERENT SOWING DATES AND SEEDING RATES IN NEWLY RECLAIMED LAND.

Ekram, A. Megawer, A.A. A. Mekdad and Heba, M. El Damy

Agronomy Department, Faculty of Agriculture, Fayoum University, Egypt

ABSTRACT

Two field trials were carried out in the Farm of the Faculty of Agriculture, Demo, Fayoum University, Egypt, during the two successive summer seasons 2016 and 2017, to study the effect of sowing dates and seeding rates on yield and its components and quality of peanuts in newly reclaimed land. The experimental design was split-plots design in RCBD with three replicates, where sowing date (1st, 20th April, 10th and 30th May) were assigned to the main plots, and seeding rate at 30, 40 and 50 kg/fad. (one feddan = 4200 m^2) were distributed in the sub-plots. The obtained results could be summarized as follows.

Sowing on April 1st gave significantly highest on all studied traits at harvest like plant height, number of branches, number of pods per plant and weight of pod per feddan (1.87 and 1.92 t\fed.), seed yield per feddan (1.06 and 1.15 t\fed.) and oil yield per feddan (512.61 and 573.81 kg\fed.) in both seasons. Decreasing the seeding rate from 50 to 30 kg\fed produced significantly for all studied traits at harvest like plant height, number of branches, weight of pods (41.85 and 44.27 g), weight of seed and oil %. On the other hand, increasing the seeding rate from 30 to 50 kg\fed produced significantly the highest values of yield in terms of pod (1.89 and 1.87 t\fed.), seed (1.01 and 1.04 ton\fed) and oil (476.20 and 494.00 kg\fed) in both season respectively.

There were highly significant effects due to the interaction between sowing dates and seeding rates on number of branches in the first season, weight of pods per plant and pod yield per feddan in the second one. The highest values of seed yield (1.21 and 1.34 tons) and oil yield (584.44 and 664.75 kg) per feddan in both seasons, respectively were obtained by sowing on 1st April and seeding rate of 50 kg/fed. The data revealed that, positive and highly significant ($P \leq 0.01$) correlations were obtained between oil yield kg fed^{-1} and each of seed yield t fed^{-1} (r = 0.993** and 0.995**) and pod yield t fed^{-1} (r = 0.888** and 0.873**) in 1st and 2nd seasons, respectively. According to Stepwise results in data in Table 6 clarified that two traits *i.e.* seed yield and oil (%) in both seasons were significantly ($P \leq 0.001$) contributed to variation in oil yield kg per feddan.

***Keywords*:** Peanut, sowing dates, seeding rates, correlations, Stepwise, yield, yield components and yield quality.

INTRODUCTION

The ground nut is a valuable food and oilseed crop. It is commonly called as the king of vegetable oilseeds crops or poor man's nut. The ground nut (also called peanut, earth nut, monkey nut, goober nut, manila nut, pinder and panda nut) is a native of South American leguminous oil seed **(Hammons, 1982)**. It belongs to family Leguminosae. It was first found in Brazil or Peru as early as 950 B.C. **(Higgins, 1951).** A peanut was probably brought to West Africa from Brazil in the 16th century and then to the African East coast and to India. Groundnut appeared to have originated in South America *i.e.,* North-West of Brazil and the secondary center of its cultivation is in Africa and then spread to other parts of the world. India is one of producer and ranks second in groundnut production after China.

Ground nut is a rich source of oil, which supplies about 500 calories per 100 g which is higher than all vegetable proteins. Groundnut is also a rich source of minerals and vitamins like vitamin-B, vitamin-E (tocopherol) **Arya *et al*. (2016)**.

Ground nut is grown on large scale in almost all the tropical and sub-tropical countries of the world. Ground nut is the third important oils seed crop of the world in production after soybean and cotton **(FAO, 1988).** The important ground nut growing countries are India, China, Nigeria, Sudan and USA. Groundnut is grown on 22.2 million ha area in more than 100 countries in the world with a total production of 34.5 MT and average productivity of 1.55 tonnes per ha. Asia accounts for 55.2 percent of the global area and 66.7 percent of the global production of the crop compared to 40.3 percent of the area and 25.6 percent of the production in Africa. It is worth to note and document that Egypt is suffering dramatically from great shortage in edible oils needed for nutritional consumption. Although the total local production from plant oils is about 340.000 t in 2015/2016, the consumption is about 2.690.000 t in the same year. This indicated that there is a great gap (87.4%) between production and consumption, which has created importation to fulfill the requirements of local market **(FAO, 2016).**

Peanut crop cultivated area at Egypt decreased from 147778 feddan in 2013 season to be 143022 feddan which yielded 1.37 tonnes per feddan in 2015 season. **(Agriculture Directorates of Governorates 2015[1])**

Peanut crop cultivated area at Fayoum province decreased from 597 feddan in 2011 season to be 45 feddan in 2016 season. Groundnut is popular among the farmers because it provides greater and assured returns compare to most of competing crops.

The yield potential of peanut is genetically determined and depends on limiting factors such as soil and climatic conditions, plant arrangement and incidence of pests or diseases. Among the factors affecting the productivity of

[1]**Agriculture Directorates of Governorates 2015**

a culture, plant density affects directly the components production. For the peanut crop, plant density may vary depending on cultivar, sowing date, fertilization and cultivation region.

Planting date plays an important role on the peanut yield, the variations of planting dates may interact with differences in climatic conditions in particular; temperature degree, photoperiod and relative humidity which affect the physiological processes by performance and behavior of genotype, and when climatic conditions are not suitable for need of one of yield components, it would negatively affect the seed yield. **Williams (2000)** suggested that physiological processes are the best tools to explain the variation in peanut yield, which are the pod filling period and the rate of pod establishment.

Seeding rates which determine the population density and consequently the area available to individual plant has been shown to affect crop growth and yield performance **(Ntare, 1990).** High density cropping in groundnut is known to reduce weed competition for space and growth resources. It was reported by **Dalley *et al*. (2004)** to exhibit greater light interception compared to low density cropping. The adoption of high density cropping has primarily been driven by the potential for higher yields obtained from such systems compared to low density production systems. A study by **Jaaffar and Gardner (1988)** showed that higher seeding rates gave greater ground cover, leaf area indices, canopy light interception, crop growth rates and ultimately higher pod yields when compared to conventional low density groundnut crop.

So the goal of this investigation is, therefore, to study the effect of suitable sowing dates and seeding rates, and their interaction for better growth and yield of groundnut crop.

MATERIALS AND METHODS

Two field trials were carried out in the Farm of the Faculty of Agriculture, Demo (29°17` N; 30°53` E), Fayoum University, Egypt, during the two successive summer seasons 2016 and 2017, to study the effect of sowing dates and seeding rates on growth, yield , yield components and quality of peanuts *Arachis hypogaea* L.

Soil characteristics:

Particle size distribution and some chemical properties of the experimental soil, were determined according to **Wilde *et al*. (1985),** and presented in Table (1).

Treatments:

Peanut variety: Giza (6) was obtained from Food Legume Research Section, Field Crop Research Institute, Agricultural Research Center, Giza, Egypt.
Sowing dates, (S) were: 1st April, April 20th, 10th May and May 30th.
Seeding rates (R) were: 30, 40 and 50 kg/fed. (one feddan = 4200 m^2).

Experimental design:

In both seasons, a split-plots design in RCBD with three replicates was used with sowing dates as main plots and seeding rates were randomly butted in sub-plots. The sub-plot area was 10.5 m^2 and consisting of five ridges of 3.5 m length and 60 cm in width.

The cultural practices:

The normal treatments of growing peanut plants were practiced and sowing was preceded by faba bean in 2016 season and sugar beet in 2017 season. Inoculated seeds just before planting with the specific Rhizobium bacteria inoculants. The assessed nitrogen fertilizer, as ammonium sulfate (20.6 % N) at 40 kg fad^{-1} was added as in three equal doses at 15, 30 and 45 days after planting. Phosphorus fertilizer, as calcium superphosphate (15.5 % P_2O_5) at 250 kg fad^{-1} rate, potassium fertilizer as potassium sulfate, 48 % K_2O at 24 kg k_2O fad^{-1} rate and organic fertilizer at 20 m^3 fad^{-1} rate were incorporated into the soil surface during seed bed preparation. Surface irrigation was adopted as recommended.

The maximum, minimum and mean daily temperature in centigrade and relative humidity, in percent, at monthly from April to November in 2016 and 2017 seasons, at Fayoum province as taken from the metrological department are shown in Table (2).

Table (1): Particle size distribution and some chemical properties of the experimental soil in 2016 and 2017 seasons.

Season			**2016**	**2017**
Sand%			66.5	76.1
Silt%			12.4	10.8
Clay%			21.1	13.1
Textural class			**Sandy clay Loam**	**Sandy Loam**
CaCO3%			7.10	5.20
Cations	meqL^{-1}	Na^+	69.80	65.70
		K^+	2.82	1.40
		Mg^{+2}	25.00	11.18
		Ca^{+2}	30.88	60.62
Anions		$SO4^{-2}$	28.60	33.40
		CL^-	92.40	94.50
		$HCO3^-$	7.50	11.0
Organic Matter %			1.47	0.70
ECe, dSm^{-1} at 25 ºC			2.89	2.33
pH at 25 Cº			8.63	8.87
Micronutrients (ppm)		Fe	6.86	4.29
		Mn	4.21	3.57
		Cu	1.46	0.69
		Zn	1.10	0.29

Table (2): The monthly averages of temperature and relative humidity during the two growing seasons at Fayoum Governorate.

	2016				2017			
	Min. Tem.	Max. Tem.	Aveg. Tem.	Relative humidity	Min. Tem.	Max. Tem.	Aveg. Tem.	Relative humidity
April	17.0	36.1	26.5	35.0	15.6	31.2	23.4	34.0
May	19.8	36.0	27.9	32.0	19.5	36.5	28.0	30.0
June	24.3	40.3	32.3	34.0	19.3	36.4	27.8	30.0
July	24.7	40.6	32.7	38.0	25.9	40.3	33.1	36.0
Aug.	24.5	39.9	32.2	36.0	26.0	40.4	33.2	36.0
Sept.	23.6	38.2	30.9	37.0	23.8	38.3	31.0	36.0
Oct.	21.6	33.0	27.3	39.0	18.6	32.3	25.5	38.0
Nov.	15.6	28.1	21.9	42.0	13.4	26.2	19.8	41.0

Data recorded:

A- Plant characteristics at harvest:

At harvest, the following data were recorded as an average of 5 plants taken randomly from each plot of three replications to determine the following characters:

1- Plant height (cm)
2- Number of branches per plant
3- Number of pods per plant
4- Weight of pods per plant (g)
5- Number of seeds per plant
6- Weight of seed per plant (g)

B- Yield characteristics and quality:

The whole peanut plants of the two middle ridges for each sub-plot were used for determination of:

1- Pods yield per fed. (ton per fed.) was estimated by weighing the pods in two ridges of each experimental unit plot in tons, then transformed into feddan.
2- Seed yield per fed. (ton per fed.) was estimated by weighing the seeds in two ridges of each experimental unit plot in tons, then transformed into feddan.
3- Seed oil content %: was determined by using the modified soxhelt apparatus and petroleum ether as a solvent according to **A. O. A. C. (1990)**.
4- Oil yield per fed. (ton per fed.). It was calculated by multiplying seed yield by oil percentage.

Statistical analysis:

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the spilt- plot design as outlined by **Gomez and Gomez (1984)**, using MSTAT statistical package (MSTAT- C). Least Significant Difference (LSD, at 5% level of probability) was used to test the differences between treatments mean. The data of oil yield and its

components of the study were analyzed by two statistical procedures; simple correlation coefficient and stepwise regression was used in order to determine the most important variables contributed to oil yield variability (Draper and Smith, 1981). For this purpose computer software SPSS (version 21) was used.

Table3. Effect of sowing dates, seeding rates and their interaction on plant height, number of branches, pod and seed, weight of pod and seed of groundnut in 2016 and 2017 seasons

Treatments		Plant height (cm)		Number of branches		Number of pods per plant		Weight of pods per plant		Number of seeds per plant		Weight of seeds per plant	
Sowing dates (S)	Seeding rates (R)	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
1st April	30 kg/fed	62.52	65.93	17.42	18.53	32.67	33.69	49.78	51.34	60.52	54.26	33.51	34.46
	40 kg/fed	60.47	60.64	16.58	17.69	30.93	31.76	48.48	49.90	59.40	60.94	32.24	32.89
	50 kg/fed	58.20	57.88	15.96	15.90	29.63	30.31	46.64	49.26	57.22	59.91	30.48	31.25
	Mean	**60.40**	**61.49**	16.65	17.37	31.08	31.92	48.30	50.17	59.05	58.37	32.08	32.87
20th April	30 kg/fed	56.10	58.77	15.45	16.71	29.48	30.11	45.63	48.44	55.88	58.22	29.61	30.12
	40 kg/fed	54.59	55.32	14.76	15.44	28.47	28.22	43.41	45.49	53.40	56.56	28.59	28.86
	50 kg/fed	52.46	50.20	14.34	14.08	27.11	27.17	40.69	42.61	51.33	55.27	27.33	27.12
	Mean	**54.38**	**54.77**	14.85	15.41	28.35	28.50	43.24	45.51	53.54	56.68	28.51	28.70
10th May	30 kg/fed	49.74	50.04	13.76	13.69	25.88	26.37	38.80	41.89	49.46	52.38	26.14	25.31
	40 kg/fed	48.06	45.76	13.19	12.76	24.88	25.28	37.09	39.79	46.60	49.96	25.01	24.24
	50 kg/fed	45.92	42.58	12.77	12.17	23.97	24.08	35.19	36.38	44.87	47.22	23.86	22.81
	Mean	**47.91**	**46.13**	13.24	12.87	24.91	25.24	37.03	39.35	46.98	49.85	25.00	24.12
30th May	30 kg/fed	44.30	40.32	12.19	11.85	22.74	22.92	33.18	35.39	43.40	43.15	22.88	22.17
	40 kg/fed	41.99	37.29	11.37	11.35	21.35	21.51	30.42	33.90	41.77	40.15	20.44	21.25
	50 kg/fed	39.43	34.63	10.92	10.99	20.40	20.88	29.45	31.48	38.53	38.27	19.48	20.21
	Mean	**41.91**	**37.42**	11.50	11.40	21.50	21.77	31.02	33.59	41.24	40.52	20.93	21.21
Mean of (R)	30 kg/fed	53.17	53.77	14.71	15.20	27.69	28.27	41.85	44.27	52.32	52.00	28.04	28.01
	40 kg/fed	51.28	49.76	13.98	14.31	26.41	26.69	39.85	42.27	50.29	51.90	26.57	26.81
	50 kg/fed	49.00	46.33	13.50	13.29	25.28	25.61	37.99	39.93	47.99	50.17	25.29	25.35
LSD (5%)	S	2.60**	2.80**	0.50**	0.80**	0.50**	1.12**	0.64**	3.92**	1.71**	4.85**	1.21**	1.03**
	R	0.54**	0.93**	0.30**	0.30**	0.30**	0.41**	0.60**	0.81**	0.70**	ns	0.51**	0.50**
	S*R	ns	ns	0.90*	ns	ns	ns	ns	4.85*	ns	ns	ns	ns

*; $P < 0.05$, **; $P < 0.01$ and ns; non-significant

Table 4. Effect of sowing dates, seeding rates and their interaction on oil %, pod, seed and oil yield of groundnut in 2016 and 2017 seasons.

Treatments		Oil percentage		Pods yield (ton/fed)		Seed yield (ton/fed)		Oil yield (kg/fed)	
Sowing dates (S)	Seeding rates (R)	2016	2017	2016	2017	2016	2017	2016	2017
1st April	30 kg/fed	48.05	50.63	1.67	1.65	0.93	0.94	446.04	474.40
	40 kg/fed	49.10	49.92	1.89	1.95	1.03	1.17	507.36	582.27
	50 kg/fed	48.45	49.47	2.04	2.16	1.21	1.34	584.44	664.75
	Mean	48.53	50.01	1.87	1.92	1.06	1.15	512.61	573.81
20th April	30 kg/fed	48.47	48.86	1.65	1.54	0.86	0.86	417.79	421.00
	40 kg/fed	48.06	48.38	1.81	1.79	0.95	0.96	456.79	463.28
	50 kg/fed	47.35	48.10	1.95	1.95	1.11	1.07	524.77	516.92
	Mean	47.96	48.44	1.80	1.76	0.97	0.96	466.45	467.07
10th May	30 kg/fed	47.27	47.56	1.54	1.45	0.79	0.76	372.62	363.35
	40 kg/fed	46.94	46.86	1.74	1.62	0.85	0.82	399.00	383.93
	50 kg/fed	46.50	46.74	1.82	1.72	0.92	0.95	425.47	444.30
	Mean	46.90	47.05	1.70	1.60	0.85	0.84	399.03	397.19
30th May	30 kg/fed	46.12	46.41	1.42	1.45	0.65	0.64	301.78	295.60
	40 kg/fed	45.98	45.85	1.57	1.56	0.74	0.72	342.38	331.84
	50 kg/fed	45.61	45.36	1.74	1.68	0.81	0.77	370.10	350.03
	Mean	45.90	45.87	1.58	1.56	0.74	0.71	338.09	325.82
Mean of (R)	30 kg/fed	47.48	48.36	1.57	1.52	0.81	0.80	384.56	388.59
	40 kg/fed	47.52	47.75	1.75	1.73	0.89	0.92	426.38	440.33
	50 kg/fed	46.98	47.42	1.89	1.88	1.01	1.04	476.20	494.00
LSD (5%)	S	0.84**	0.71**	0.10**	0.10**	0.03**	0.10**	17.06**	39.64**
	R	ns	0.20**	0.03**	0.03**	0.03**	0.03**	13.78**	15.64**
	S*R	ns	ns	ns	0.10*	0.10**	0.10**	27.56**	31.28**

*; $P < 0.05$, **; $P < 0.01$ and ns; non-significant.

RESULTS AND DISCUSSION

A- Effect of sowing dates:

The data in Table (3&4) presented the effect of sowing dates on plant height, number of branches, number of pods, weight of pods, number of seeds, weight of seeds per plant and oil percentage, as well as yields in terms of pods, seeds and oil per feddan in 2016 and 2017 seasons. Sowing dates exhibited highly significant differences in formers traits on in both seasons. According to LSD test early sowing date on 1st April produced significantly the maximum values of plant height (60.40 and 61.49 cm), number of branches (15.396 and 15.90), number of pods (31.08 and 31.92), weight of pods (48.30 and 50.17 g), number of seeds (59.05 and 58.37), weight of seeds per plant (32.08 and 32.87) and oil % (48.53 and 50.01) as well as, pods yield (1.87 and 1.92), seed yield (1.06 and 1.15) and oil yield (512.61 and 573.81) than the other sowing dates in both seasons respectively. On the other hand, in 2016 and 2017 seasons delay sowing date on 30th May significantly produced the minimum values for the formers traits. The superiority of early sowing dates

might have been due to most favorable climatic conditions throughout the growth period compared to other sowing dates. The reduction in oil yield per feddan at late sowing in both seasons was expected since seed number and weight per plant and seed yield per feddan well as, percentage of oil decreased at late sowing as mentioned before. The previous results agree with those reported by many investigators among then **Abouziena *et al.* (2013), Maamoun and Abd El Gawad (2013), Sarkees (2015)** and **Shendage *et al*. (2018).**

B- Effect of seeding rates:

During the two seasons of experimentation, seeding rates had a highly significant effect on plant height, number of branches and pods, weight of pods and seeds as well as pod, seed and oil yield. In 2016 season seeding rates had a highly significant effect on number of seeds per plant and in 2017 season on oil percentage. The results in Table (3&4) indicated that plant height, number of branches and pods, weight of pods and seeds traits decreased from 53.17 to 49.00, 14.71 to 13.50, 27.69 to 25.28, 41.85 to 37.99 and 28.04 to 25.29 in 2016 season and from 53.77 to 46.33, 15.20 to 13.29, 28.27 to 25.61, 44.27 to 39.93and 28.01 to 25.35 in 2017 season with increased rate of seeding from 30 to 50 kg/fed respectively. On the other hand, pod, seed and oil yield traits decreased from 1.89 to 1.57, 1.01 to 0.81 and 476.20 to 384.56 in the first season and from 1.88 to 1.52, 1.04 to 0.80 and 494.00 to 388.59 in the second season with decreasing seeding rates from 50to 30 kg/fed respectively. The increase in oil yield with increasing plant density was primarily attributed to differences in the amount of photosynthetically active radiation (PAR) intercepted, which was evident during both vegetative growth as well as, seed yield and oil percentage development. It is worth to mention here that increasing seeding rates up to 50 kg/fed. caused a significant increase in seed yield per feddan. This indicating that the increase in plant number could be easily counter balanced the depression in number of branches, total pods, weight of pods per plant, number of seeds per plant as well as seed yield per plant. The previous results agree with those reported by many investigators among then **Bell *et al*. (1987), Giayetto *et al.* (1998), Dapaah *et al*. (2014), Gabisa *et al*. (2017)** and **Zhao *et al*. (2017).**

C. Interactions Effect:

Regarding the interaction effect between sowing dates and seeding rates. The results clearly showed a significant effect on seed and oil yield per feddan in both season as well as, number branches per plant in the first season, pods weight per plant and pod yield per feddan in the second season. The highest values of seed yield (1.21 and 1.34 tons) and oil yield (584.44 and 664.75 kg) per feddan in both seasons, respectively were obtained by sowing on 1st April and seeding rate of 50 kg/fed.

Yield analysis study

Correlation coefficient: The correlation coefficients in Table 5 between oil yield kg fed^{-1} and each of number of pod and seed, weight of pod and seed plant^{-1} g, pod and seed yield t fed^{-1} and oil % were computed in order to throw light on the relationship of effectual traits interest. The data revealed that, positive and highly significant ($P \leq 0.01$) correlations were obtained between oil yield kg fed^{-1} and each of seed yield t fed^{-1} (r = 0.993** and 0.995**) and pod yield t fed^{-1} (r = 0.888** and 0.873**) in 1st and 2nd seasons, respectively. According to Stepwise results in data in Table 6 clarified that two traits *i.e.* seed yield and oil (%) in both seasons were significantly ($P \leq 0.001$) contributed to variation in oil yield kg per feddan.

Table 5. A matrix of simple correlation coefficient between oil yield and other important traits estimated in 2016 and 2017 season.

Character	Number of pod plant^{-1}		Weight of pod plant^{-1}(g)		Number of Seed plan^{-1}		Weight of Seed p^{-1}(g)		Pod yield (t fed^{-1})		Seed yield (t fed^{-1})		Oil (%)		Oil yield (kg fed^{-1})	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Number of pod p^{-1}	1	1	.983**	.869**	.973**	.799**	.971**	.926**	.399**	.421**	.619**	.614**	.784**	.962**	.672**	.685**
Weight of pod p^{-1} (g)			1	1	.987**	.820**	.985**	.870**	.411**	.426**	.628**	.610**	.790**	.839**	.682**	.666**
Number of Seed p^{-1}					1	1	.987**	.751**	.392**	.495**	.610**	.670**	.774**	.790**	.664**	.711**
Weight of Seed p^{-1} (g)							1	1	.363**	.433**	.574**	.655**	.753**	.958**	.630**	.723**
Pod yield (t fed^{-1})									1	1	.910**	.894**	.417**	.445**	.888**	.873**
Seed yield (t fed^{-1})											1	1	.575**	.642**	.993**	.995**
Oil (%)													1	1	.667**	.716**
Oil yield (t fed^{-1})															1	1

Table 6. Correlation coefficient (r), coefficient of determination (R^2) and standard error of the estimates (SEE) for predicting oil yield (kg/fed) in 2016 and 2017 seasons.

Season	R	R^2	SEE	Sig.	Fitted equation
2016	1.00	1.00	1.45	***	Oil yield = -428.13 + 474.34 seed yield + 9.05 oil
2017	1.000	1.000	2.31	***	Oil yield = -413.25 + 485.98 seed yield + 8.54 oil

Conclusion

Data showed that under newly reclaimed land condition it could be recommended to apply the early sowing date on 1th April combined with rate of 50 kg per feddan to accomplish acceptable profit yield of peanuts pods, seed and oil yield as well.

REFERENCES

A.O.A.C. (1990). Official methods of analysis. Association of Official Analytical ChemistsInternational. 15th Ed. AOAC-Int., Arlington, VA.

Abouziena, H. F.; M.S.A. Abd El Wahed; M.A.T. Eldabaa and E.R. El-Desoki (2013). Effect of sowing date and reduced herbicides rate with additives on peanut (*Arachis Hypogaea* L.) productivit y and

associated weeds. Journal of Applied Sciences Research, 9(3): 2176-2187.

Arya1, S. S.; A. R. Salve and S. Chauhan (2016). Peanuts as functional food: a review. Journal of Food Science Technology. 53 (1):31–41.

Bell, M. J; R. C. Muchow and G. L. Wilson (1987). The Effect of plant population on peanuts (*Arachis hypogaea*) in a monsoonal tropical environment. Field Crops Research, 17: 91-107

Dalley, C. B.; J. J. Kells. and K. A. Renner (2004). Effect of glyphosate application timing and row spacing on weed growth in corn (*Zea mays*) and soybean (*Glycine max*). Weed Technology. 18:177-182.

Dapaah, H. K.; I. Mohammed and R. T. Awuah (2014). Growth and yield performance of groundnuts (*Arachis hypogaea* L.) in response to plant density. International Journal of Plant and Soil Science 3(9): 1069-1082.

Draper, N.R. and H. Smith (1981). Applied regression analysis.2nd edition, Wiley series in probability and mathematical statistics, John Wiley & Sons. N.Y., pp. 709.

FAO (Food and Agriculture Organization of the United Nations), (1988). FAOSTAT: World Crop Production data.

F**AO (Food and Agriculture Organization of the United Nations), (2016).** FAOSTAT: World Crop Production data.

Gabisa, M.; T. Tana and E. Urage (2017). Effect of planting density on yield components and yield of groundnut (*Arachis hypogaea* L.) varieties at Abeya, Borena Zone Southern Ethiopia. International Journal of Scientific Engineering and Applied Scienc e, 3(3):1-18.

Giayetto, O; G. A. Cerioni and W. E. Asnal (1998). Effect of sowing spacing on vegetative growth, dry matter production, and peanut pod yield. Peanut Science. 25:86-92.

Gomez, K. A and A. A. Gomez (1984). Statistical Procedures for Agriculture Research. 2nd ed. John Wiley and Sons. New York, USA. 680pp.

Hammons, R. O. (1982). Origin and early history of the pea nut. In pea nut science and Technology, ed. H.E. Pattee and C.T. young, pp.-1-20.

Higgins, B. B. (1951). Origin and early history of the pea nut. The pea nut the Unpredictable legume. Washington: National Fertilizer Association.

Jaaffar, Z. and F. P. Gardner (1988). Canopy development, yield and market quality in peanut as affected by genotype and planting pattern. Crop Science. 28:299-305.

Maamoun, Howaida. A. and A. M. Abd El Gawad (2013). Effect of Salicylic acid, Biofertilization and Sowing Dates on Peanut

(*Arachis hypogaea* L.) Yield under Semi-arid Conditions. Egypt. J. Agron. Vol. 35(1): 37- 64.

Ntare, B. R. (1990). Intercropping morphologically different cowpeas with pearl millet in a short season environment in the Sahel. Experimental Agriculture. 26: 4-48.

Sarkees, N. A. (2015). Effect of sowing dates on development, seed yield and quality of some peanut (*Arachis hypogaea* L.) genotypes. Jordan Journal of Agricultural Sciences, 11, (2): 367- 380.

Shendage, R. C.; A. B. Mohite and R. K. Sathe (2018). Effect of sowing times and varieties on growth and yield of summer groundnut (*Arachis hypogaea* L.). Journal of Pharmacognosy and Phytochemistry. 7(1): 720-722.

Wilde, S. A; R. B. Corey; J. G. Lyer and G. K. Voigt (1985). Soil and plant analysis for tree culture. 3rd edition. Oxford and IBM Publishers, New Delhi, India. 93–106.

Williams, J. H. (2000). The implications and applications of resource capture concepts to crop improvement by plant-breeding. Agric. For. Meteorol. 104: 49-58.

Zhao, C.; C. Shao; Z. Yang; Y. Wang; X. Zhang; M. Wang and Jr. M. E. McGiffen (2017). Effects of planting density on pod development and yield of peanuts under the pattern of precision planted peanuts. Legume Research, 40 (5): 901-905.

الملخص العربى

إستجابة الفول السودانى للاختلاف فى مواعيد الزراعة ومعدلات التقاوى فى الأراضى الجديدة

إكرام على مجاور وعلى عبدالله على مقداد و هبة ممدوح عبدالواحد.
قسم المحاصيل - كلية الزراعة - جامعة الفيوم- الفيوم- مصر.

أقيمت تجربتان حقليتان بمزرعة كلية الزراعة ، بمنطقة دمو ، جامعة الفيوم ، مصر، خلال الموسمين ٢٠١٦ و ٢٠١٧، لدراسة تأثير مواعيد الزراعة ومعدلات التقاوى على المحصول ومكوناته ونوعية الفول السوداني فى الأراضى حديثة الإستصلاح. كان التصميم الإحصائى المستخدم هو القطاعات الكاملة العشوائية المنشقة مرة واحدة فى ثلاثة مكررات، حيث تم توزيع مواعيد الزراعة (١ إبريل ، ٢٠ أبريل ، ١٠ مايو و ٣٠ مايو) فى القطع الرئيسية، بينما تم توزيع معدلات التقاوى (٣٠ و ٤٠ و ٥٠ كجم / فدان) في القطع الفرعية **يمكن تلخيص النتائج التي تم الحصول عليها على النحو التالي.**

تأثير مواعيد الزراعة:

كان لمواعيد الزراعة تأثير معنوي كبير على جميع الصفات الزراعية قيد الدراسة في كلا الموسمين أعطى ميعاد الزراعة في الأول من أبريل أعلى القيم لجميع الصفات المدروسة عند الحصاد مثل ارتفاع النبات، وعدد الفروع، وعدد ووزن القرون ، وعدد ووزن البذور ونسبة الزيت (٤٨.٥٣ و ٥٠.٠١ ٪) وكذلك صفات المحصول مثل محصول القرون (١.٨٧ و ١.٩٢ طن/فدان) ، ومحصول البذور (١.٠٦ و ١.٥١ طن/فدان) و محصول الزيت (٥١٢.٦١ و ٥٧٣.٨١ كجم \ فدان.) في كلا الموسمين.

تأثير معدلات التقاوى:

كان لمعدلات التقاوى تأثيراً معنوياً كبيراً على جميع الصفات المدروسة في كلا الموسمين. حيث أدى إنخفاض معدل التقاوى من ٥٠ إلى ٣٠ كجم/فدان إلى تحقيق أعلى القيم لجميع الصفات المدروسة عند الحصاد مثل ارتفاع النبات وعدد الفروع، وعدد القرون (٢٧.٦٩ و ٢٨.٢٧) ووزن القرون (٤١.٨٥ و ٤٤.٢٧ جم) ، وصفتى عدد ووزن البذور وكذلك النسبة المئوية للزيت. من ناحية أخرى فإن زيادة معدل التقاوى من ٣٠ إلى ٥٠ كجم للفدان أنتجت بشكل كبير أعلى قيمة للمحصول من حيث القرون (١.٨٩ و ١.٨٧ طن/فدان)، والبذور (١.٠١ و ١.٠٤ طن/فدان) والزيت (٤٧٦.٢٠ و ٤٩٤.٠٠ كم/فدان) في كلا الموسمين على التوالي.

تأثير التفاعل بين مواعيد الزراعة ومعدلات التقاوى:

لم تكن هناك تأثيرات ذات دلالة إحصائية ناتجة من تفاعل مواعيد الزراعة X معدلات التقاوى في جميع الصفات الزراعية قيد الدراسة في هذا البحث بإستثناء عدد الفروع في الموسم الأول، بينما كان وزن القرون لكل نبات و صفة محصول القرون للفدان في الموسم الثاني ولكن كانت أعلى قيم لصفة محصول البذور (١.٢١ و ١.٣٤ طن للفدان) ومحصول الزيت (٥٨٤.٤٤ و ٦٦٤.٧٥ كجم للفدان) في كلا الموسمين على التوالي ناتجة من تفاعل ميعاد الزراعة الأول في ١ أبريل ومعدل التقاوى الثالث ٥٠ كجم/فدان.