Yield of NSIC Pn 2 Variety of *Arachis Hypogaea* L. as Affected by Different Levels of 14-14-14 Synthetic Chemical Nutrient

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Abstract. This study was conducted to determine the yield performance of peanut applied with different rates of Complete Fertilizer (14-14-14). The experiment was done under the soil and climatic condition in Zamboanga Sibugay. The experiment was laid using Randomized Complete Block Design (RCBD) with four treatments and four replications. An area of 168 square meters was divided into 16 plots each measured 1.5 meters wide and 7 meters long excluding canals. There was only one factor used in the study, the different rates of Complete Fertilizer (14-14-14). The four treatments were T_1 – 1.64 grams per hill, T_2 – 2.46 grams per hill, T_3 – 3.28 grams per hill and T_4 - control. NSIC Pn 2 (Biyaya 12) was the variety used in this research. Two seeds per hill were planted with the distance of 20 cm between hills and 90 cm between rows. Analysis of Variance (ANOVA) showed the average number of pods per plant per plot per treatment; average number of seeds per pod per plot per treatment; total number of pods per plot per treatment and total weight of pods in kilogram per plot per treatment revealed that the Computed "f" was lesser than the tabulated "f" at both 5% (3.49) and 1% (5.95) levels of significance. In addition, ANOVA on the average number of pods per kilogram per plot per treatment revealed that the Computed "f" (5.19) was greater than the Tabulated "f" (3.49) at 5% level of significance. The result unveiled a significant difference.

Keywords: Complete Fertilizer, Peanut, Yield Performance

Introduction

Peanut is considered one of the most important leguminous crops in Egypt. Peanut was grown in Egypt for oil production, fresh human consumption or export, since its cultivation is thrived in the reclaimed sandy soil. In addition, it has the ability for improving the physical structure as well as the fertility of such soil types. So many investigations carried out to raise peanut quantity and quality in sandy soil. Varieties of peanut vary in growth habit where some of them are semi-spreading and others are erect. Their root system may be varied in volume and size and may be of different capabilities to absorb nutrients .Several studies have addressed different aspects of the N fertilization.

Mahmoud and EL-Far (2000) and Ali *et al.* (2010) concluded that applying N fertilizer up to 40 Kg ha^{-1} increased pod and seed yields ha^{-1} AL–Shormillesy and Abd El-Hameed (2006) found that increasing N- level from 30 Kg to 70Kg N $fed.^{-1}$ significantly increased gradually pod and seed yields (Kg $fed.^{-1}$) in both seasons. Ali *et al.* (2010) indicated that increasing N-levels from 30 Kg to 70 Kg N $fed.^{-1}$ increased oil yield, while the seed oil percentage was decreased. Emam (2012) reported that in addition nitrogen fertilization at 75 kg $fed.^{-1}$ caused a significant increase in peanut yield. Also, Pendashteh *et al.* (2011) found that 80 kg N ha^{-1} gave significantly higher seed yield ha^{-1} than that of control treatment. Ali and Mowafy (2003) & Ismail and Abdel–Momen (2007) found positive and significant correlation between pod yield $fed.^{-1}$ and pod yield $plant^{-1}$, 100-pod weight, 100–seed weight and shelling%.

Phosphorus (P) and potassium (K) fertilization had intensively compared to those conducted on nitrogen (N). This might be attributed to the fact that adequate supplement of P is important for increasing nodule formation and increased N fixation in legume plants (Robson, 1983). Moreover, K has a beneficial effect on nitrogen fixation and transformation of photosynthesis products from leaves to the root nodules. Phosphorus fertilization was

investigated by several workers who recommended varied dose of $P_2 O_5$ (Kg ha^{-1}) for raising yield and its attributes, 40 Kg ha^{-1} (Lai, 1988), 60 Kg ha^{-1} (Yakadri *et al*., 1992), 72 Kg ha^{-1} (Thimmegoroda, 1993), reported 25 and (30-30-50kg $fed.^{-1}$ NPK) gave the best combinations for high pod yield as well as oil and protein % for both Giza 4 and Giza 5 cultivars. EL-Sayed and Yousef (2003) reported 71 Kg P_2O_5 ha^{-1}.

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

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

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

Methodology

Research Design

The experimental design was laid using the Randomized Complete Block Design (RCBD). The 168 square meters was divided into 16 plots with four replications. Random numbers were generated from the calculator. This was used to distribute the treatments in each plot by ranking them from lowest to highest.

Data Gathering Procedure

The harvested peanut pod from each treatment was placed in separate sack to avoid misrepresentation of data during statistical analysis. Each sack was marked with the corresponding number of treatments where the pods were taken. The following data was gathered for analysis and interpretation such as the average number of pods, the average number of pods per kilogram, the average number of seeds per pod, the total number of pods, and the total weight of pods in kilogram.

Statistical Treatment of Data

The Analysis of Variance (ANOVA) for one way classification was used to determine if there was significant difference on the yield of peanut as affected by different rates of complete fertilizer (14-14-14). Duncan's Multiple Range Test (DMRT) was also used to determine which of the different rates of complete fertilizer revealed a maximum yield.

Results and Discussion

This chapter deals with the analysis and interpretation of the data gathered from the conducted experimental study.

Table 1. Average Number of Pods per Plant per Plot per Treatment

	T_1	T_2	T_3	T_4	
	73.5	67.00	102.70	81.00	
	92.30	104.10	91.40	89.00	
	94.70	115.50	91.60	85.50	
	100.40	94.50	126.90	82.60	
Total	360.90	381.10	412.60	338.10	1,492.70
Mean	90.23	95.28	103.15	84.53	93.2

Table 1 shows that T_3 obtained the highest average number of pods per plant plot per treatment with 103.15, followed by T_2 with 95.28 and T_1 90.23 pods. T_4 obtained the lowest average number of 84.53 pods per plant per plot per treatment.

Table 2. Average Number of Pods per Kilogram per Plot per Treatment

	T_1	T_2	T_3	T_4	
	512.33	521.66	524.00	504.66	
	519.00	532.33	524.33	503.66	
	531.0	521.33	526.33	512.00	
	520.23	524.33	510.00	512.33	
Total	2,082.66	2,099.65	2,084.66	2,032.65	8,299.62
Mean	520.67	524.91	521.17	508.16	518.73

Table 2 shows that T_2 obtained the highest average number of pods per kilogram of 524.91 followed by T_3 with 521.17 and T_1 508.16 pods. T_4 gained the least average number of pods per kilogram of 508.16.

Table 3. Average Number of Seeds per Pod per Plot per Treatment

	T_1	T_2	T_3	T_4	
	2.25	2.32	2.04	2.23	
	2.22	2.26	2.30	2.20	
	2.00	2.42	2.34	2.26	
	2.48	2.28	2.28	2.48	
Total	8.95	9.28	8.96	9.17	36.36
Mean	2.24	2.32	2.24	2.29	2.27

Table 3 shows that T_2 acquired the highest average number of 2.32 seeds per pod per plot per treatment followed by T_4 with 2.29 seeds. T_1 and T_3 obtained the least average number of seeds per pod per plot per treatment of 2.24.

Table 4. Total Number of Pods per Plot per Treatment

	T_1	T_2	T_3	T_4	
	5,696.00	6,572.80	5,184.00	4,704.00	
	6,060.80	5,904.20	6,662.40	5,849.60	
	5,862.40	6,048.00	7,392.00	6,425.60	
	5,286.40	5,472.00	8,121.60	4,288.00	

Total	22,905.60	23,997.00	27,360.00	21,267.20	95,529.80
Mean	5,726.40	5,999.25	6,840.00	5,316.80	5,970.61

Table 4 shows that T_3 gained the highest total number of pods of 27,360, followed by T_2 with the total number of 23,997 and T_1 with 22,905.60. T_4 obtained the least number of pods having a total number of 21,267.20 pods.

Table 5. Total Weight of Pods in Kilogram per Plot per Treatment

	T_1	T_2	T_3	T_4	
	6.00	5.25	6.75	6.50	
	4.75	7.25	7.50	4.75	
	4.75	6.50	6.25	5.75	
	6.50	6.12	6.25	4.75	
Total	22.00	25.12	26.75	21.75	95.62
Mean	5.50	6.28	6.69	5.44	5.98

Table 5 shows that T_3 gained the heaviest total weight of 26.75 kg of pods, followed by T_2 25.12 kg and T_1 22.00 kg. T_4 gained the lightest total weight of pods in kilogram per plot per treatment with a total of 21.75 kg.

Table 6. ANOVA for the Average Number of Pods per Plant per Plot per Treatment

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square	Computed "f"	Tabulated "f" 5%	1%
Column Means	749.51	3	249.83	1.16	3.49	5.95
Error	2,567.43	12	213.95			
Total	3,316.94	15				

Table 6 shows the Analysis of Variance for the average number of pods per plot per treatment. The result of statistical analysis reveals that the computed "f" (1.16) is lesser than the tabulated "f" for both 5% (3.49) and 1% (5.95) levels of significance. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. Meaning, there is no significant difference on the average number of pods per plant per plot per treatment as applied with Complete Fertilizer (14-14-14).

Table 7. ANOVA for the Average Number of Pods per Kilogram per Plot per Treatment

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square	Computed "f"	Tabulated "f" 5%	1%
Column Means	638.27	3	212.75	5.19	3.49	5.95
Error	491.96	12	40.99			
Total	1,130.23	15				

Table 7 shows the Analysis of Variance for the average number of pods per kilogram per plot per treatment. The result of the statistical analysis reveals that the computed "f" (5.19) is greater than the tabulated "f" at 5% (3.39) levels of significance. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This means, there is a significant difference on the average number of pods per kilogram per plot per treatment as applied with different rates of Complete Fertilizer (14-14-14) at 5% levels of significance. However, the result of the statistical analysis reveals that the computed "f" (5.19) is lesser than the tabulated

"f" at 1% (5.95) levels of significance. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This means, there is no significant difference on the average number of pods per kilogram per plot per treatment as applied with different rates of Complete Fertilizer (14-14-14) at 1% levels of significance.

Table 8. ANOVA for the Average Number of Seeds per Pod per Plot per Treatment

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square	Computed "f"	Tabulated "f" 5%	1%
Column Means	0.020	3	0.006	0.6	3.49	5.95
Error	0.23	12	0.01			
Total	0.254	15				

Table 8 shows the Analysis of Variance for the average number of seeds per plot per treatment. The result of the statistical analysis reveals that the computed "f" is lesser than the tabulated "f" at both 5% (3.49) and 1% (5.95) levels of significance. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. Meaning, there is no significant difference on the average number of seds per plot per treatment as applied with different rates of Complete Fertilizer (14-14-14).

Table 9. ANOVA for the Total Number of Pods per Plot per Treatment

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square	Computed "f"	Tabulated "f" 5%	1%
Column Means	4,975,061.04	3	1,658,353.68	2.31	3.49	5.95
Error	8,611,553.63	12	717,629.46			
Total	13,586,614.67	15				

Table 9 shows the Analysis of Variance for the total number of pods per plot per treatment. The result of statistical analysis reveals that the computed "f" is lesser than the tabulated "f" at both 5% (3.49) and 1% (5.95) levels of significance. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This means, there is no significant difference on the total number of pods per plot per treatment as applied with different rates of Complete Fertilizer (14-14-14).

Table 10. ANOVA for the Total Weight of Pods in Kilogram per Plot per Treatment

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square	Computed "f"	Tabulated "f" 5%	1%
Column Means	4.46	3	1.48	2.34	3.49	5.95
Error	7.67	12	0.63			
Total	12.13	15				

Table 10 shows the Analysis of Variance for the total weight of pods in kilogram per plot per treatment. The result of statistical analysis reveals that the computed "f" is lesser than the tabulated "f" at both 5% (3.49) and 1% (5.95) levels of significance. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. Meaning, there is no significant difference on the total weight of pods per plot per treatment as applied with different rates of Complete Fertilizer (14-14-14).

Conclusions

Based on the result of the study, there was no significant difference on the average number of pods per plant per plot per treatment, average number of seeds per pod per plot per

treatment, total number of pods per plot per treatment and total weight of pods in kilogram per plot per treatment as applied with different rates of complete fertilizer (14-14-14). However, average number of pods per kilogram per plot per treatment showed that there was a significant difference as applied with different rates of complete fertilizer (14-14-14).

Recommendations

Based on findings and conclusions, the following are recommended:

1. The adoption of any of the four treatments to obtain more number of pods per plant;
2. The adoption of any of the four treatments to obtain more number of seeds per pod;
3. The adoption of any of the four treatments to obtain more number of pods per plot;
4. The adoption of any of the four treatments to obtain heavier weight of peanut pods in kilogram; and
5. The adoption of $_2$ and T_3 to achieve more number of peanut pods per kilogram.

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