Archives of Agriculture Sciences Journal
Print ISSN: 2535-1680
Online ISSN: 2535-1699

ARCHIVES OF AGRICULTURE SCIENCES JOURNAL

Volume 6, Issue 1, 2023, Pages 170–183

Available online at www.agricuta.edu.eg

DOI: https://dx.doi.org/10.21608/aasj.2023.299878

Impact of fertilization and weed control treatments on annual weed control and peanut (*Arachis hypogaea* L.) productivity

Fakkar A. A. O.*, El-Enany Maha F., Eid S. D. M.

Weed Research Central Laboratory (WRCL), Agricultural Research Center, Giza, Egypt

Abstract

During the succeeding summers of 2020 and 2021, two field experiments were set up in Ismailia Agricultural Research Station, Agricultural Research Center, Giza, Egypt to study the effect of three fertilizer levels (20 kg N + 15 kg P+ 24 kg K per feddan) (feddan = 4200 m² = 0.420 hectares = 1.037 acres), (40 kg N +30 kg P+ 48 kg K per feddan) and (60 kg N+45 kg P+ 72 kg K per feddan) and six weed control treatments (Amex 48% EC at rate 1.5 L / feddan applied, Cougar 40% EC at rate 2.0 L / feddan, Stomp extra 46% CS at rate 1.5 L / feddan, Bazagran 48% AS at rate 0.75 L/ feddan + Fusilade super 12.5% EC at rate 1.0 L / feddan, Hand hoeing twice at 30 and 45 days from sowing and unweeded control) on control annual weeds, yield and its components of peanut and oil%. The treatments were set up in a split plot design, fertilizer levels were placed in the main plots, and weed control treatments were placed in sub-plots. The results revealed that fertilizer level $N_{60}P_{45}K_{72}$ increased the dry weight of total annual weeds (g/m^2) by 99.3 and 109.6% in the 2020 and 2021 seasons, respectively, as compared with $N_{20}P_{15}K_{24}$. Fertilizer level $N_{60}P_{45}K_{72}$ increased pod yield (ardeb/feddan) (Ardeb = 5.44 imperial or 5.619 U.S. bushels) by 29.4 and 25.7% in the first and second seasons, respectively, compared with fertilizer level $N_{20}P_{15}K_{24}$. Weed control treatments reduced the dry weight of the total weeds (g/m^2) at 75 days after sowing. The treatments used (Bazagran + Fusilade super), hand hoeing twice, and Stomp extra decreased the dry weight of total annual weeds 75 days after sowing by 85, 78%, and 78% in the 2020 season and 85.1, 77.5%, and 76.3% in the 2021 season, respectively as compared with unweeded check. The same treatments increased pod yield (ardeb/feddan) by 160.5, 147.1, and 142.6% in the 2020 season and by 195.4, 185.7, and 164.8% in the 2021 season, respectively, compared to the unweeded check. The interaction between fertilizer level $N_{20}P_{15}K_{24}$ and weed control treatments (Bazagran + Fusilade super), hand hoeing twice, and Stomp extra resulted in the highest reduction in dry weight of total annual weeds at 75 days after sowing in both seasons compared with fertilizer level $N_{60}P_{45}K_{72}$ and unweeded check. The interaction between fertilizer level $N_{60}P_{45}K_{72}$ and weed control treatments (Bazagran + Fusilade super), hand hoeing twice, and Stomp extra resulted in the highest pod yield and its components in both seasons, compared with fertilizer level $N_{20}P_{15}K_{24}$ and unweeded check. Thus, from this study the best package for growing peanut in sandy soil by fertilities peanut with level $N_{60}P_{45}K_{72}$ and used one of treatments (Bazagran at rate 0.75 L / feddan after 21 days from sowing +Fusilade super at rate 1 L / feddan after 30 days from sowing) or hand hoeing twice at 30 and 45 days from sowing or Stomp extra at rate 1.5 L / feddan (after sowing and before irrigation) which gave the highest control of annual weeds and the highest pods yield / feddan under Ismailia governorate area conditions, Egypt.

Keywords: peanut, *Arachis hypogaea*, butralin, pendimethalin, acetochlor, fluazifop-p-butyl, bentazone.

*Corresponding author: Fakkar A. A. O.,
E-mail address: sakkar444@yahoo.com

Copyright © 2023
(cc) BY-NC

1. Introduction

Peanut (*Arachis hypogaea* L.) is considered as one of the important summer oil crops. The seeds contained approximately 50% oil and high-quality protein. It is usually cultivated in light soil as well as in reclaimed areas. Peanut suffer from weeds competition due to its nature to grow in somewhat prostrate manner that it does not cover rapidly the soil. Many researchers have estimated yield losses of this crop due to weed competition to be at least 90% in Egypt (Fayed *et al.*, 1990). This competition lies mainly in the 15-60 days after peanut sowing, with the maximum occurring approximately 45 days after sowing (Yadav *et al.*, 1984). Fayed *et al.* (1992) reported that the highest reduction in weeds density was obtained by hoeing twice as well as pendimethalin at 1.74 L / feddan pre-emergence. Teuton et al. (2004) found that the green peanut displayed high tolerance to the post-treatment weed control agents bentazone (0.56 kg a.i./ha), clethodim (0.21 kg a.i./ha), and fluazifop (0.21 kg a.i./ha). Pendimethalin and oxyfluorfen were discovered by El Sehly (2005) to be the most effective herbicides against a number of grassy weeds. Khozimy (2006) showed that fluazifop-p-butyl had a passable impact on the dry weights of narrow and total weeds at 45 days after planting, whereas clethodim had a higher ability to reduce dry weights of narrow and total weeds compared to other treatments. Moshtohry *et al.* (2007) indicated that butralin was an alternative to oxyfluorfen and pendimethalin against annual weeds, whose dry weight fell by 85-92%. The dry weight of the grasses dropped by 84-99% when treated with clethodim or fluazifop-butyl. Many researchers have investigated how herbicides affect yield and yield components. Youssry *et al.* (2008) demonstrated that clethodim was the most effective post-emergence treatment for reducing weed dry weight, with a weed-free-induced reduction in dry weight ranging from 91.5 to 99.8%. The findings also indicated that the tested herbicides enhanced the dry weight, pod yield, and yield components; however, there was no discernible difference between any of the treatments and the unweeded condition in terms of crude protein and oil content in the seeds. Eid and El-Housini (2021) found that spraying herbicide combinations (pendimethalin + clethodim) considerably enhanced pod yield (ardeb/feddan) and yield components compared with the weedy check treatment. With respect to the effect of NPK fertilizer levels on peanuts, El-Habbasha *et al.* (2005) showed that increasing levels of phosphorus increased the number and weight of pods, weight of seeds plant-1, weight of 100 seeds, seed yield, and N, P, and K content in seeds. A modest but significant increase in pod and seed yields (kg feddan^{-1}) was observed in both seasons when N levels were increased from 30 to 70 kg feddan^{-1}, according to Al-Shormillesy and Abd El-Hameed

(2006). Ismail and Abdel-Momen (2007) discovered a strong and positive association between pod yield per feddan, pod yield per plant, weight of 100-pod, weight of 100-seed and shelling %. Balkcom (2007) found that peanut residue had little to no impact on the yields of rye biomass, N content, carbon (C/N) ratio, or uptake of N, P, K, Ca, and Zn. Fertilizers are a significant factor in increasing crop production. The correct amount of NPK fertilizer is essential for producing large quantities of crops. The weight of 100 seeds, weight of pods, yield of straw and seeds, percentage of shelled seeds, and uptake of macronutrients (N, P, and K) and micronutrients (Fe, Mn, and Zn) by groundnut straw and seeds all significantly increased (Ibrahim and Eleiwa, 2008). Ali *et al.* (2010) indicated that increasing levels of N fertilizer from 30 kg to 70 kg per feddan enhanced oil production, whereas adding fertilizer of N up to 40 kg per feddan increased pod and seed yields. Emam (2012) showed that additional nitrogen fertilizer at a rate of 75 kg feddan^{-1} significantly increased peanut production. Mahmowd *et al.* (2014) reported that increasing N, P, and K rates from 30-30-24 to to 60-45-48 kg per feddan resulted in significantly higher plant height, branch count per plant, seed yield, pod yield per feddan seed, 100-pod weight, 100-seed weight, shelling percentage, and N, P, and K uptake. Bekele *et al.* (2022) indicated that increasing N and P rates from 0:0 to 46:46 kg/ha increased pods and seeds yield/plant and oil%. The main aim of this study was to determine the effectiveness of NPK fertilizers and weed control treatments in enhancing peanut productivity and annual weed control under the Ismailia governorate conditions in Egypt.

2. Materials and methods

Double field experiments were conducted at the Ismailia Agricultural Research Station, Agricultural Research Center during the 2020 and 2021 summer seasons to examine the impact of NPK fertilizer levels and weed control treatments on peanut productivity. The preceding crop was wheat in both seasons. The Giza 5 cultivar was used, and the sowing dates were May 22nd and May 25th in the first and second season, respectively. Other customary agricultural procedures for peanut farming in this region have been carried out. The seeding rate was 45 kg seeds/feddan, using the Afir technique (dry method). The sub-plot measured 10.5 m^2 (3.0 m × 3.5 m). The experiment was a split-plot design with four replicates. Each experiment included 18 treatments, which were the combination of three fertilizer levels added in the main plots and six weed control treatments in sub-plots as follows:

A. Main plots (fertilizer levels)

1. $N_{20}P_{15}K_{24}$: (100 kg ammonium sulphate +100 kg super phosphate + 50 kg potassium sulphate/feddan).

2. $N_{40}P_{30}K_{48}$: (200 kg ammonium sulphate +200 kg super phosphate +100 kg potassium sulphate/feddan).
3. $N_{60}P_{45}K_{72}$: (300 kg ammonium sulphate +300 kg super phosphate +150 kg potassium sulphate/feddan).

B. Subplots (weed-control treatments)

1. Amex 48% EC (butralin) at a rate of 1.5 L/feddan was applied pre-emergence (after sowing and before irrigation).
2. Cougar 40% EC (pendimethalin 29%+acetochlor 20%) at the rate of 2.0 L/feddan applied pre-emergence (after sowing and before irrigation).
3. Stomp extra 46% CS (pendimethalin) at a rate of 1.5 L/feddan applied as pre-emergence (after sowing and before irrigation).
4. Bazagran (bentazone) at rate of 0.75 L/feddan (at 21 days after sowing) + Fusilade super EC 12.5 % (fluazifop-p-butyl) at rate 1.0 L/feddan (at 30 days after sowing).
5. Hand hoeing twice (30 and 45 days after sowing).
6. Unweeded control.

The herbicidal treatments were uniformly applied using a Knapsack sprayer with a 200 L water/feddan spray volume. The region's recommendations for other farming techniques were followed. According to Jackson (1973), the soil analysis of the experimental site in both seasons is presented in (Table 1).

Table (1): Physical and chemical characteristics of experimental soil during the 2020 and 2021 seasons.

Seasons	Particle size distribution (%)				Soil texture	Chemical analysis					
	Coarse sand	Fine sand	Silt	Clay		EC (dsm^{-1})	PH (1:1)	Organic matter (%)	Available (mg kg^{-1})		
									Total N%	P (ppm)	K (ppm)
2020	25.32	69.37	3.82	1.49	Sandy	0.35	7.80	0.21	11.5	5.8	145
2021	28.03	66.18	3.94	1.85	Sandy	1.38	7.70	0.25	13.0	6.6	158

2.1 Data obtained

2.1.1 Weed survey

Weeds were manually removed from each plot 75 days after sowing and categorized as grassy or broad-leaved weeds. In experimental fields during the 2020 and 2021 growing seasons, annual broad-leaved weeds (*Portulaca oleracea*) and (*Euphorbia geniculeata*), as well as, annual grasses (*Digitaria samgunalis*), (*Cenchrus echinatus*) and (*Dactyloctenium aegyptium*) predominated. A steady weight was achieved after air drying, followed by 24 hours of drying at 70 °C in an oven.

2.1.2 Peanut yield

At harvest, 10 plants were randomly selected from each sub-plot to evaluate the following attributes: plant height (cm), number of branches, number of pods, weight of pods per plant (g), number of seeds per plant, weight of

seeds per plant (g), 100 pod weights (g), and pod yield/plot (kg). The pod yield per plot was used to compute pod yield (ardeb/feddan).

2.1.3 Chemical analysis

2.1.3.1 NPK content

To assess the nutrient concentration, strong sulfuric acid and perchloric acid were used. Plant samples were ground 30, 60, and 90 days after sowing and wet digested (1:1) after drying in air (A.O.A.C., 1990). Utilizing the micro-Kjeldahl method, as outlined by Black (1965), total nitrogen was measured. Phosphorus and potassium (%) were calculated using a flame photometer colorimetric in accordance with Jackson (1973).

2.1.3.2 Oil content

Seed samples were taken randomly from each treatment to determine the oil content according to the method described by A.O.A.C. (1990), using petroleum ether (40-50°C) in a Soxhlet apparatus.

2.2 Statistical Analysis

Using the MSTAT-C computer program (Freed *et al.* (1989), statistical analysis was performed in accordance with Gomez and Gomez (1984). The treatments were compared using a 5% level least significant difference (LSD) test.

3. Results and Discussion

3.1 Effect of fertilizer levels on dry weight of grassy weeds (g/m^2)

The data collected in Table (2) show that raising NPK levels from $N_{20}P_{15}K_{24}$ to $N_{60}P_{45}K_{72}$ in two seasons considerably increased the dry weight of grassy weeds (g/m^2). The dry weight of grassy weeds (g/m^2) increased at fertilizer levels $N_{60}P_{45}K_{72}$ and $N_{40}P_{30}K_{48}$ by (120.8 and 40.8%) and (134.0 and 37.9%) in both growing seasons, respectively, as compared with fertilizer levels $N_{20}P_{15}K_{24}$.

Table (2): Effects of fertilizer levels on dry weight of weeds (g/m^2) during 2020 and 2021seasons.

Fertilizer levels	Dry weight of weeds (g/m^2) at 75 DAS					
	Grassy weeds		Broad-leaved weeds		Total weeds	
	2020	2021	2020	2021	2020	2021
$N_{20}P_{15}K_{24}$	49.92	45.25	74.17	62.78	124.09	108.03
$N_{40}P_{30}K_{48}$	70.29	62.39	98.87	97.70	169.16	160.09
$N_{60}P_{45}K_{72}$	110.21	105.90	137.08	120.52	247.29	226.42
LSD at 5%	11.48	11.45	14.19	18.17	24.42	24.11

3.2 Effect of fertilizer levels on dry weight of broad-leaved weeds (g/m^2)

The data in Table (2) indicate that fertilizer levels at $N_{60}P_{45}K_{72}$ and $N_{40}P_{30}K_{48}$ increased the dry weight (g/m^2) by (84.8 and 33.3%, respectively) and (92.0 and 55.6%, respectively), compared with fertilizer levels of $N_{20}P_{15}K_{24}$ in the 2020 and 2021 seasons.

3.3 Effect of fertilizer levels on dry weight of total weeds (g/m^2)

Fertilizer levels at $N_{60}P_{45}K_{72}$ and $N_{40}P_{30}K_{48}$increased the dry weight of all weeds (g/m^2) by (99.3 and 36.3%) and (109.6 and 48.2%) in 2020 and 2021 seasons, respectively, as compared with fertilizer level $N_{20}P_{15}K_{24}$. This result demonstrated that a higher dose of NPK accelerated weed growth and, hence, increased weed dry weight. These findings are consistent with those of Ali *et al.* (2010) and Emam (2012).

3.4 Effect of fertilizer level on yield, yield components, and oil percentage

The results in Tables (3 and 4) showed that fertilizer level had a significant impact on peanut output and yield characteristics. In the 2020 and 2021 seasons, fertilizer levels significantly affected plant height (cm), number of branches per plant, number of pods/plant, pod weight/plant (g), number of seeds/plant, weight of seeds/plant, 100 pod weight/plant, pod yield (ardeb/feddan), and oil percentage.

Table (3): Effects of fertilizer levels on yield and yield components of peanuts during 2020 and 2021 seasons.

Fertilizer levels	Plant height (cm)		No. of branches/plant		No. of pods/plant		Weight of pods/plant (g)		No. of seeds/plant	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
$N_{20}P_{15}K_{24}$	46.08	48.67	10.92	10.08	27.33	24.75	52.54	47.92	54.79	50.17
$N_{40}P_{30}K_{48}$	47.33	52.04	13.87	12.79	32.25	27.62	60.75	58.21	61.25	56.79
$N_{60}P_{45}K_{72}$	54.25	58.67	15.00	12.92	36.67	30.71	75.21	70.29	66.71	63.46
LSD at 5%	3.61	2.17	NS	1.43	2.83	1.18	4.92	8.25	2.31	2.03

Table (4): Effects of fertilizer levels on yield and yield components of peanuts during the 2020 and 2021 seasons.

Fertilizer levels	Weight of seeds/plant (g)		100 pod weight (g)		Pods yield of (ardeb/feddan)		Oil (%)	
	2020	2021	2020	2021	2020	2021	2020	2021
$N_{20}P_{15}K_{24}$	65.90	60.06	158.70	153.75	11.84	11.35	38.37	38.58
$N_{40}P_{30}K_{48}$	73.28	67.70	163.62	168.88	13.81	13.18	40.75	40.54
$N_{60}P_{45}K_{72}$	79.20	75.44	187.80	181.54	15.32	14.27	43.12	43.83
LSD at 5%	3.07	2.45	7.18	4.98	1.05	1.17	1.34	1.88

In comparison to fertilizer level $N_{20}P_{15}K_{24}$, fertilizer level $N_{60}P_{45}K_{72}$ increased the plant height, number of branches per plant, number of pods/plant, weight of pods/plant (g), number of seeds/plant, weight of seeds/plant (g), 100-pod weight (g), and oil % by (17.7, 37.4, 34.2, 43.1, 21.8, 20.2, 18.3%, and 12.4%) in the 2020 season and by (20.5, 28.2, 24.1, 46.7, 26.5, 25.6, 18.1%, and

13.6%) in 2021 season, respectively. Fertilizer levels at $N_{60}P_{45}K_{72}$ increased pod yield (ardeb/feddan) by (29.4 and 25.7%) in the 2020 and 2021 seasons, respectively, as compared with fertilizer level at $N_{20}P_{15}K_{24}$. Fertilizer levels at $N_{40}P_{30}K_{48}$ increased the same characteristics by (2.7, 27.0, 18.0, 15.6, 11.8, 11.2, 3.1, and 6.2%) in the 2020 season and (6.9, 26.9, 11.6, 21.5, 13.2, 12.7, 9.8%, and 5.1%) in the 2021 season, and increased the pod yield (ardeb/feddan) by (16.6%) and by (16.1%) in 2020 and 2021, respectively, as compared to fertilizer level at $N_{20}P_{15}K_{24}$. These findings are consistent with those reported by Ali *et al.* (2010), Emam (2012), Mahmowd *et al.* (2014) and Bekele *et al.* (2022).

3.5 Effect of fertilizer levels on NPK concentration in peanut plants

Table (5) revealed that the concentrations of N, P, and K in peanut plants declined with increasing age, indicating the transformation of the metabolized materials from shoots to storage organs. Increased NPK fertilizer levels significantly increased the N, P, and K concentrations in peanut plants in the 2020 and 2021 seasons.

Table (5): Effect of fertilizer levels on NPK concentration in peanut plants during the 2020 and 2021 seasons.

NPK fertilizer levels	Nitrogen (%)			Phosphorus (%)			Potassium (%)		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
2020 season									
$N_{20}P_{15}K_{24}$	4.41	3.55	1.45	0.245	0.182	0.098	3.53	3.11	1.87
$N_{40}P_{30}K_{48}$	4.72	3.78	1.54	0.265	0.194	0.121	3.81	3.33	1.93
$N_{60}P_{45}K_{72}$	4.84	3.96	1.73	0.274	0.211	0.148	3.97	3.54	2.05
LSD at 5%	0.32	0.31	NS	0.07	NS	0.05	0.15	0.21	NS
2021 season									
$N_{20}P_{15}K_{24}$	3.24	2.54	1.11	0.223	0.172	0.111	3.14	3.05	1.55
$N_{40}P_{30}K_{48}$	3.45	3.52	1.32	0.252	0.167	0.126	3.32	3.17	1.56
$N_{60}P_{45}K_{72}$	3.85	3.74	1.46	0.274	0.174	0.145	3.65	3.29	1.61
LSD at 5%	0.16	0.11	NS	0.03	NS	0.02	0.12	0.11	NS

The results presented in Table (5) revealed that NPK fertilizers had a significant effect on N, P, and K % of peanut plants various studied growth periods at 30, 60, and 90 DAS, with the exception of P % in peanut plants at 60 DAS in the first season. Increasing NPK fertilizer from $N_{20}P_{15}K_{24}$ to $N_{60}P_{45}K_{72}$ increased N, P, and K % in peanut plants at different growth periods in both seasons. The level of $N_{60}P_{45}K_{72}$ fertilizer recorded the highest values of N, P, and K % in plants at different growth periods in the two seasons compared with the $N_{20}P_{15}K_{24}$ level. These results agree with those obtained by Ibrahim and Eleiwa (2008) and Mahmowd *et al.* (2014).

3.6 Effects of weed control treatments on dry weight of grassy weeds (g/m^2)

Data in Table (6) indicated that all weed control treatments had a significant reduction in the dry weight of grassy

weeds (g/m^2) as compared with the unwedded check. The treatments (Amex 48% EC, Cougar 40% EC, Stomp extra 46 % CS, Bazagran 48% AS+Fusilade super 12.5% EC, and hand hoeing twice) gave the best effective in controlling grassy weeds in both seasons. Treatments (Amex, Cougar, Stomp extra, Fusilade super + Bazagran, and hand hoeing twice) decreased grassy weeds by (71.7, 77.2, 78.6, 86.7%, and 79.0%) in the first season and (72.4, 76.0, 77.2, 83.6%, and 78.0%) in the second season, respectively, compared with the unweeded treatment. These results are consistent with those reported by El-Sehly (2005) and Khozimy (2006).

3.7 Effects of weed control treatments on dry weight of broad-leaved weeds (g/m^2)

The application of Amex at rate 1.5 L/feddan, Cougar at rate 2.0 L/feddan, Stomp extra at the rate of 1.5L/feddan, (Bazagran at rate of 0.75 L/feddan+Fusilade super at rate 1.0 L/feddan) and hand hoeing twice decreased the braod-leaved weeds dry weight (g/m^2) by (74.7, 77.0, 77.6, 83.8 and 77.8%) in 2020 season and by (72.8, 73.7, 75.7, 86.1 and 77.2%) in 2021 season, respectively as compared with unweeded treatment (Table 6). These results were consistent with those obtained by Moshtohry *et al.* (2007).

Table (6): Effect of weed control treatments on dry weight of weeds (g/m^2) during the 2020 and 2021 seasons.

Weed control treatments	Dry weight of weeds (g/m^2) at 75 DAS					
	Grassy weeds		Broad-leaved weeds		Total weeds	
	2020	2021	2020	2021	2020	2021
Amex at 1.5L/feddan	63.00	55.37	75.17	71.35	138.17	126.72
Cougar at 2L/feddan	50.83	48.17	68.17	68.92	119	117.09
Stomp at 1.5L/feddan	47.75	45.75	66.33	63.88	114.08	109.63
Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	29.58	32.90	48.17	36.51	77.75	69.41
Hand hoeing twice.	46.83	44.17	65.75	59.95	112.58	104.12
Un-weeded	222.83	200.72	296.67	262.50	519.5	463.22
L.S.D at 5%	14.06	16.25	15.12	18.85	22.06	21.63

3.8 Effects of weed control treatments on dry weight of total weeds (g/m^2)

Weed control treatments significantly reduced the dry weight of total weeds (g/m^2) in the 2020 and 2021 seasons. Amex at rate 1.5 L/feddan, Cougar at rate of 2.0 L/feddan, (Bazagran at rate of 1.5 L/feddan, (Bazagran at rate of 0.75 L/feddan +Fusilade super at rate 1.0 L/feddan) and hand hoeing twice decreased the dry weight of total weeds (g/m^2) by (73.4, 77.1, 78.0, 85.0, and 78.3%) and by (72.6, 74.7, 76.3, 85.1, and 77.5%) in both growing seasons, respectively, as compared with the unweeded check (Table 6). These results agree with those obtained by Eid and El-Housini (2021).

3.9 Effects of weed control treatments on yield, yield components and oil percentage

The data in Tables (7 and 8) indicate that all weed control treatments had a significant influence on yield and yield

attributes, which increased plant height (cm), number of branches/plant, 100 pod weight (g), seed weight/plant (g), pod weight/plant (g), pod yield (ardeb/feddan), and oil percentage compared with the unweeded treatment.

Table (7): Effect of weed control treatments on yield and yield attributes of peanuts harvested during the 2020 and 2021 seasons.

Weed control treatments	Plant height (cm)		No. of branches/plant		No. of pods/plant		Weight of pods/plant (g)		No. of seeds/plant	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Amex at 1.5L/feddan	44.67	51.00	12.50	11.25	29.82	26.33	59.25	55.75	57.08	53.25
Cougar at 2L/feddan	47.58	52.00	13.58	11.42	32.17	29.33	68.17	61.50	63.17	55.58
Stomp at 1.5L/feddan	51.67	54.18	14.17	11.83	34.42	29.75	70.15	62.50	64.75	60.00
Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	55.75	61.92	15.58	13.25	38.58	32.83	75.50	73.33	72.75	68.25
Hand hoeing twice.	53.33	57.08	14.77	12.92	37.92	30.83	75.25	71.75	65.00	61.00
Un-weeded	42.33	40.58	9.58	10.92	19.50	20.08	33.58	33.50	42.75	41.92
LSD at 5%	6.12	4.01	1.06	1.02	2.55	2.40	6.90	9.06	4.94	4.89

The treatments of (Bazagran+Fusilade super, Hand hoeing twice and Stomp extra) significantly increased plant height (cm), No. of branches/plant, No. of pods/plant, weight of pods/plant (g) and No. of seeds/plant by (31.7, 26 and 22.1%), (62.6, 54.2 and 47.9%), (97.8,94.5 and 76.5%), (124.8,124.1 and 108.9%) and (70.2,52 and 51.5) in 2020 season and by (52.6,40.7 and 33.5%), (21.3, 18.3 and 8.3%), (63.5, 53.5 and 48.2%), (119, 114.2 and 86.6%) and (62.8, 45.5 and 43.1%) in 2021 season, respectively compared with unweeded check. The same treatments increased weight of seeds/plant (g), weight of 100 pod (g), pod yield (ardeb/per feddan) and oil % by (85.7, 67.9 and 65.2%), (44.2, 28.7 and 25.2%), (195.4, 185.7 and 164.8%) and (16.2, 5.5 and 2.4%) in first season and by (79.2, 60.1 and 59.7 %), (40.8, 27.9 and 26.1%), (160.5, 147.1 and 142.6%) and (24.5, 16.1 and 14.9%) in second season, respectively as compared with unweeded check (Table 6). This result is consistent with those reported by Johnson *et al.* (2005) and Eid and El-Housini (2021).

Table (8): Effect of weed control measures on weight of seeds/plant (g), 100-pod weight (g), pod yield (ardeb/feddan) and oil percentage.

Weed control treatments	Weight of seeds / plant (g)		100 pod weight (g)		Pod yield (ardeb/feddan)		Oil (%)	
	2020	2021	2020	2021	2020	2021	2020	2021
Amex at 1.5L/feddan	67.80	63.90	156.99	167.17	13.92	13.52	41.67	42.33
Cougar at 2L/feddan	77.70	66.70	164.45	167.75	14.65	13.58	41.33	41.33
Stomp at 1.5L/feddan	77.70	73.00	175.62	171.62	14.83	14.68	39.00	41.00
Bazagran 0.75L/feddan+Fusilade super at 1L/feddan	87.30	81.90	202.31	191.62	16.54	15.76	44.25	44.42
Hand hoeing twice.	78.95	73.20	180.58	174.08	16.00	14.95	40.17	41.42
Un-weeded	47.02	45.71	140.27	136.10	5.60	6.05	38.08	35.67
LSD at 5%	5.43	5.90	11.15	6.11	0.96	1.00	2.99	2.86

3.10 Effect of weed control treatments on NPK concentrations in plants

Table (9) showed that weed control treatments significantly affected the uptake of N, P, and K % by peanuts at 30, 60, and 90 days after sowing in the two seasons. The highest values of N, P,

and K in peanuts at 30, 60, and 90 DAS were observed in Fusilade super+ Bazagran, hand-hoeing twice, and stored extra, and the lowest values were obtained from Amex and unweeded treatments in both seasons.

Table (9): Effect of weed control treatments on nutrient concentrations in peanut plants during the 2020 and 2021 seasons.

Weed control treatments	Nitrogen (%)			Phosphorus (%)			Potassium (%)		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
2020 season									
Amex at 1.5L/feddan	3.12	3.09	1.17	0.220	0.185	0.093	3.33	2.97	1.66
Cougar at 2L/feddan	3.57	3.14	1.34	0.254	0.211	0.112	3.63	3.44	1.89
Stomp at 1.5L/feddan	4.08	3.45	1.58	0.274	0.231	0.131	3.86	3.56	2.12
Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	4.89	3.87	1.88	0.311	0.273	0.174	4.49	3.96	2.71
Hand hoeing twice.	4.25	3.65	1.74	0.298	0.245	0.152	4.15	3.74	2.22
Un-weeded	2.85	2.75	1.10	0.198	0.175	0.077	2.98	2.53	1.35
LSD at 5%	0.19	0.13	0.15	0.05	0.02	0.3	0.15	0.11	0.06
2021 season									
Amex at 1.5L/feddan	3.87	3.45	1.72	0.216	0.144	0.107	3.23	3.05	1.71
Cougar at 2L/feddan	4.09	3.62	1.89	0.232	0.165	0.122	3.42	3.21	1.96
Stomp at 1.5L/feddan	4.23	3.85	2.05	0.252	0.177	0.132	3.72	3.32	2.13
Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	4.84	4.27	2.23	0.295	0.211	0.175	4.15	3.76	2.74
Hand hoeing twice.	4.47	4.13	2.17	0.275	0.196	0.165	3.86	3.53	2.45
Un-weeded	3.65	3.11	1.53	0.211	0.128	0.101	2.86	2.84	1.25
LSD at 5%	0.17	0.13	0.14	0.05	0.02	0.02	0.15	0.12	0.07

3.11 Interaction effects on dry weight of weeds (g/m^2)

The data in Table (10) indicated that the dry weights of grassy, broad-leaved, and total weeds (g/m^2) were significantly affected by most interactions under study. The interaction between fertilizer level $N_{60}P_{45}K_{72}$ gave the highest values of dry weight of grassy, broad-leaved, and total weeds under all weed control treatments, whereas the fertilizer $N_{20}P_{15}K_{24}$ level gave the lowest values under all weed control treatments in both seasons.

Table (10): Interaction effects between fertilizer levels and weed control treatments on weed dry weight (g/m^2) during the 2020 and 2021 seasons.

Fertilizer levels	Weed control treatments	Dry weight of weeds (g/m^2)					
		Grassy weeds		Broad-leaved weeds		Total weeds	
		2020	2021	2020	2021	2020	2021
$N_{20}P_{15}K_{24}$	Amex at 1.5L/feddan	39.00	30.62	49.25	49.57	88.25	80.19
	Cougar at 2L/feddan	32.75	35.27	60.50	50.60	93.25	85.87
	Stomp at 1.5L/feddan	32.00	25.02	47.75	43.10	79.75	68.12
	Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	11.00	15.25	25.25	18.22	36.25	33.47
	Hand hoeing twice.	31.75	24.82	46.50	39.17	78.25	63.99
	Un-weeded	153.00	145.47	215.75	176.02	368.75	321.49
$N_{40}P_{30}K_{48}$	Amex at 1.5L/feddan	44.25	47.12	58.25	68.80	102.5	115.92
	Cougar at 2L/feddan	55.75	51.10	66.75	79.37	122.5	130.47
	Stomp at 1.5L/feddan	42.75	38.85	57.00	66.37	99.75	105.22
	Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	19.75	24.02	42.75	31.77	62.50	55.79
	Hand hoeing twice.	40.75	32.10	52.00	52.50	92.75	84.6
	Un-weeded	219.25	181.12	316.50	292.40	535.75	473.52
$N_{60}P_{45}K_{72}$	Amex at 1.5L/feddan	100.50	63.37	98.50	89.57	199	152.94
	Cougar at 2L/feddan	80.00	88.37	100.50	103.22	180.5	191.59
	Stomp at 1.5L/feddan	66.50	83.25	98.25	84.07	164.75	167.32
	Bazagran at 0.75L/feddan +Fusilade super at 1L/feddan	58.00	59.45	76.50	59.50	134.50	118.95
	Hand hoeing twice.	60.00	68.40	91.00	67.92	151	136.32
	Un-weeded	296.25	275.55	357.75	318.85	654	594.4
LSD at 5%		24.36	29.48	26.19	25.34	38.14	29.14

Treatments (Fusilade super + Bazagran, hand hoeing twice, and Stomp extra) resulted in the highest reduction in dry weight of grassy, broad-leaved, and total weeds (g/m^2) under the fertilizer level $N_{20}P_{15}K_{24}$ in both seasons.

3.12 Interaction effects on yield and its components

Table (11) showed that, with the exception of the number of branches per plant, which was not significant in the two seasons, the interaction between fertilizer levels and weed control treatments had a significant effect on plant height (cm), 100 pod weight (g), pod weight/plant (g), and pod yield (ardeb/feddan). In comparison to fertilizer level $N_{20}P_{15}K_{24}$ under unweeded treatment, Fusilade super + Bazagran and hand hoeing twice produced the highest values under fertilizer $N_{60}P_{45}K_{72}$ level in the 2020 and 2021 seasons.

3.13 Interaction effects on oil percentage

The results in Table (11) showed that there was a considerable impact on seed quality from the interaction between fertilizer levels and weed control treatments, as compared to $N_{20}P_{15}K_{24}$ under unweeded treatment.

Table (11): Interaction effects between fertilizer levels and weed control treatments on yield and yield components of peanuts during 2020 and 2021 seasons.

Fertilizer levels	Weed control treatments	Plant height (cm)		No. of branches / plant		No. of pods / plant		Weight of pods plant (g)		No. of seed / plant		Weight of seeds / plant (g)		Weight of 100 pod (g)		Pod yield (ardeb/feddan)		Oil (%)	
		2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
$N_{20}P_{15}K_{24}$	T_1	43.00	48.50	10.50	11.25	28.00	25.50	53.00	43.00	56.25	50.50	69.00	60.60	148.52	152.97	12.50	11.85	38.50	39.25
	T_2	44.50	43.50	9.75	9.00	26.50	23.00	46.25	34.75	55.25	46.25	65.40	55.50	157.50	152.75	12.25	11.75	37.75	38.00
	T_3	42.00	50.00	11.00	8.75	28.75	26.00	56.75	51.50	55.75	52.75	66.90	63.30	154.95	157.07	12.75	12.75	39.00	39.50
	T_4	54.00	56.00	13.50	12.25	33.50	30.25	67.50	72.25	66.50	61.75	79.80	74.10	196.95	170.57	14.75	13.27	42.00	40.75
	T_5	48.00	46.00	12.75	11.25	30.50	26.50	60.75	56.75	57.50	54.25	74.20	65.10	162.60	163.15	13.92	13.30	40.75	40.00
	T_6	41.00	36.00	8.00	8.00	16.75	17.25	31.00	29.25	37.50	35.50	40.15	41.77	131.65	125.97	4.90	5.25	32.25	34.00
$N_{40}P_{30}K_{48}$	T_1	41.20	51.25	13.50	12.00	35.50	24.75	61.75	60.25	65.75	49.50	63.90	69.30	152.45	166.65	14.50	13.87	39.25	41.00
	T_2	41.00	49.25	13.50	10.75	28.00	29.00	56.25	53.25	53.25	57.75	78.90	59.40	151.70	162.05	14.00	13.47	40.50	41.75
	T_3	53.25	55.50	15.30	13.25	34.00	29.75	70.25	66.25	65.75	60.50	81.10	72.60	156.60	176.10	15.50	14.45	38.00	39.50
	T_4	55.25	60.00	16.75	13.75	38.75	32.25	75.00	72.00	70.50	67.00	84.60	80.40	198.22	192.47	16.82	15.95	43.50	44.50
	T_5	53.25	55.50	15.00	14.50	37.50	30.75	72.25	67.50	68.50	63.00	82.20	75.60	180.92	180.40	16.25	15.02	42.50	43.00
	T_6	40.25	40.75	9.50	12.50	19.75	20.25	29.00	30.00	43.75	43.00	49.00	48.92	141.82	135.62	5.80	6.30	40.75	33.50
$N_{60}P_{45}K_{72}$	T_1	53.25	58.25	17.50	15.50	35.25	28.75	64.75	62.50	61.75	59.75	74.10	71.70	170.00	176.30	14.75	14.82	41.75	44.75
	T_2	58.00	59.75	14.75	10.50	47.75	31.50	79.25	75.25	68.50	62.75	81.55	75.30	179.25	183.82	19.00	15.37	44.50	44.25
	T_3	51.00	58.25	13.50	11.25	34.50	32.00	84.00	91.00	70.00	76.00	84.00	80.10	198.22	181.05	15.50	14.57	41.25	42.50
	T_4	63.75	69.75	18.25	14.00	41.50	36.25	94.75	75.75	81.25	66.75	97.50	91.20	220.20	211.90	18.87	18.90	47.25	48.00
	T_5	53.75	61.00	14.75	12.25	39.00	33.00	87.75	76.00	71.75	68.25	86.10	81.90	211.75	189.47	17.67	15.35	42.75	44.00
	T_6	45.75	45.00	11.25	14.00	22.00	22.75	40.75	41.25	47.00	47.25	51.92	52.42	147.35	146.70	6.10	6.62	41.25	39.50
LSD 5%		10.60	6.94	NS	NS	4.41	4.16	11.95	15.73	8.55	8.47	9.40	10.21	19.31	10.58	1.66	1.74	5.18	4.95

Fusilade super + Bazagran and hand hoeing twice under fertilizer $N_{60}P_{45}K_{72}$ level produced the highest values of oil% as compared to the unweeded treatment under fertilizer level $N_{20}P_{15}K_{24}$ in the 2020 and 2021 seasons.

3.14 Interaction effects on concentrations of NPK in plants

The interaction between fertilizer levels and weed control treatments on the concentrations of NPK in peanut plants was not significant, so it was not discussed (Table 11).

4. Conclusion

For growing peanut crop in Ismailia area under sprinkler irrigation system, to control annual weeds species (*Portulaca oleracea* and *Euphorbia geniculeata*) as annual broad-leaved weeds, (*Digitaria samgunalis*, *Cenchrus echinatus* and *Dactyloctenium aegyptium*) as annual grassy weeds could be used one of weed control treatments (Bazagran at rate 0.75 L/feddan+Fusilade super at rate 1L/feddan or hand hoeing twice at 30 and 45 days from sowing or Stomp extra at rate 1.5 L/feddan, after sowing and before irrigation) under fertilizer level $N_{60}P_{45}K_{72}$, which gave the highest control of annual weeds, highest pods yield/feddan and oil%. Such treatments can solve weed problems in peanut fields in areas irrigated by sprinkler irrigation in sandy soil.

References

A.O.A.C. (1990), *Official Methods of Analysis*, 15th Ed., Association of Official Analytical Chemists, Inc., Virginia, USA, pp. 770–771.

Ali, E. A., Hafiz, S. I., Kotb, M. A. and Abbas, M. G. (2010), "Effect of plant density, nitrogen fertilization and foliar spraying with iron and zinc on peanut in newly cultivated sandy soils", *Agricultural Research Journal - Suez Canal University*, Vol. 10 No. 1, pp. 29–36.

Al-Shormillesy, S. M. A. and Abd El-Hameed, I. M. (2006), "Effect of some agricultural practices on productivity of peanut under sandy soil conditions", *Zagazig Journal of Agricultural Research*, Vol. 33 No. 4, pp. 631–644.

Balack, C. A. (1965), Methods of Soil Analysis, American Society of Agronomy, Madison, Wisconsin, USA.

Balkcom, K. S., Wood, C. W., Adams, J. F. and Meso, B. (2007), "Suitability of peanut residue as a nitrogen source for a rye cover crop", *Scientia Agricola*, Vol. 64 No. 2, pp. 181–186.

Bekele, G., Dechassa, N. and Tana, T. (2022), "Effect of inorganic and organic fertilizers on productivity of groundnut (*Arachis hypogaea* L.) varieties in East Hararghe, Eastern Ethiopia", *Oil Crop Science*, Vol. 7 No. 3, pp. 112–121.

Eid, S. D. M. and El-Housini Ebtesam, A. (2021), "The relationship effect of bacterial inoculation, plant spacing and weed control on nodulation, weeds, yield and net return of peanut production", *Plant Cell Biotechnology and Molecular Biology*, Vol. 22, pp. 178–190.

El-Habbasha, S. F., Kandil, A. A., Abu-hagaza, N. S., Abd El-Haleem, A. K., Khalfallah. M. A. and Behairy, T. Gh. (2005), "Effect of phosphorus levels and some biofertilizers on dry matter, yield and yield attributes of groundnut", *The Bulletin, Faculty of Agriculture-Cairo University*, Vol.

26, pp. 237–252.

El-Sehly, S. E. (2005), *Weed control in peanut and its effect on exportation characters*, Ph.D. Thesis, Faculty of Agriculture, Al-Azhar University, Egypt.

Emam, S. M. (2012), "Effect of biological and chemical fertilization on growth, yield and yield components of peanuts (*Arachis hypogaea L.*)", *Minufiya Journal of Agricultural Research*, Vol. 6 No. 1, pp. 1429–1439.

Fayed, M. T., El-Nagar, S. M. and Fawzy, H. (1990), *Solarization and mechanical weed control in peanuts (Arachis hypogaea L.)*, Proceedings of the 4th Conference of Agronomy, Faculty of Agriculture, Zagazig University, Cairo, Egypt, 15-16 September, Vol. 2, pp. 465–480.

Fayed, M. T., El-Nagar, S. M. and Fawzy, H. (1992), *Performance of several weed control programs in peanut (Arachis hypogaea L.)*, Proceedings of the 5th Conference of Agronomy, Faculty of Agriculture, Zagazig University, Cairo, Egypt, Vol. 2, pp. 1044–1060.

Freed, R., Einensmith, S. P., Gutez, S., Reicosky, D., Smail, V. W. and Wolberg, P. (1989), *User's Guide to MSTAT-C: A Software Program for the Design, Management and Analysis of Agronomic Research Experiments*, Michigan State University, East Lansing, ML, USA.

Gomez, K. A. and Gomez, A. A. (1984), "Chi-square test", In *Statistical Procedures for Agricultural Research*, John Wiely and Sons, Toronto, Italy, pp. 458–477.

Ibrahim, S. A. and Eleiwa Mona, E. (2008), "Response of Groundnut (*Arachis hypogaea* L.) plants to foliar feeding with some organic manure extracts under different levels of NPK fertilizers", *World Journal of Agricultural Sciences*, Vol. 4 No. 2, pp. 140–148.

Ismail, F. M. and Abdel-Momen, S. M. (2007), "Effect of some soil amendments on yield and disease incidence in peanut (*Arachis hypogaea*, L.), *Egyptian Journal of Applied Science*, Vol. 22 No. 2B, pp. 630–650.

Jackson, M. L. (1973), *Soil Chemical Analysis*, Prentice Hall of India, New Delhi, India, pp. 144–197.

Khozimy, A. M. H. (2006), *The role of some herbicides for controlling weeds and their side effects on peanut crop*, M.Sc. Thesis, Faculty of Agriculture, Suez Canal University, Egypt.

Mahmowd, M. W. Sh., Sedeck, F. Sh., Khafagy, E. E. E. and Mosaad, I. S. M. (2014), "Effect of applied n, p and k on peanut yield, quality and nutrients uptake in sandy soils", *Journal of Soil Sciences and Agricultural Engineering*, Vol. 5 No. 8, pp. 6141–6154.

Moshtohry, M. R., Nassar, A. N. M., Ismail, F. M., Ibrahim, M. F. (2007), "Effect of varieties and weed control treatments of peanut (*Arachis hypogea* L.)", *Journal of Agricultural Science - Mansoura University*, Vol. 32 No. 10, pp. 8043–8063.

Teuton, T. C., Main, C. L., MacDonald G. E., Ducar, J. T. and Brecke, B. J. (2004), "Green peanut tolerance to pre emergence and post emergence herbicides", *Weed Technology*, Vol. 18 No. 3, pp. 719–722.

Yadav, S. K., Singh, S. P. and Bhan, V. M. (1984), "Crop-weed competition studies in groundnut (*Arachis hypogea* L.)", *The Journal of Agricultural Science*, Vol. 103 No. 2, pp. 373–376.

Youssry, M. A. M., Reda, L. A., Khozimy, A. M. and Mosleh, Y. Y. (2008), "Efficacy of the selected herbicides in controlling weeds and their side effects on peanut", *Journal of Plant Protection Research*, Vol. 48 No. 3, pp. 355–363.