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Effects of Organic and Inorganic Fertilizers on Growth and Yield of Peanut (*Arachis hypogea* L.)

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ABSTRACT

Peanut is a vital legume crop that plays an important role in human nutrition and the farmers economy. This valuable crop is widely cultivated in Afghanistan and significantly contributes to the national economy. However, farmers lack proper guidance on fertilizer selection and usage. Therefore, a field experiment was conducted during the summer season of 2024 under irrigated conditions to study the impact of organic and inorganic fertilizers on growth and yield of the local Zarati peanut variety in Hakeem Abad village, Khogyani district of Nangarhar province, Afghanistan. Before sowing, a laboratory soil analysis was conducted, which showed that the soil was slightly acidic and deficient in essential nutrients. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 10 treatments. Each treatment involved different types and amounts of fertilizers: T_1 (no fertilizer), T_2 (farmyard manure (FYM) 20 t/ha), T_3 (poultry manure (PM) 10 t/ha), T_4 (50% nitrogen and phosphorus (NP)), T_5 (100% NP), T_6 (50% NP + FYM), T_7 (100% NP + FYM), T_8 (50% NP + PM), T_9 (100% NP + PM), and T_{10} (50% NP + FYM + PM). The results showed that T_{10} (50% NP + FYM + PM) recorded highest plant height (107.6 cm), number of branches per plant (7.6), number of leaves per plant (96.3), number of pods per plant (46.0), number of seeds per pod (3.4), and yield (4.0 t/ha). On the other hand, the highest straw yield (9.1 t/ha) was observed in T_9 (100% NP + PM), indicating the strong effect of full phosphorus and nitrogen application with poultry manure. Additionally, the highest benefit-cost (B:C) ratio of 4.7 was recorded under T_{10}, highlighting the economic viability of this treatment. The combined application of organic and inorganic fertilizers (T_{10}) demonstrated that integrated fertilization (50% NP + FYM + PM) significantly enhances peanut growth, yield, and profitability, offering a sustainable solution for peanut production in the region.

Keywords: Growth, Inorganic and Organic Fertilizers, Peanut, Yield.

INTRODUCTION

Legumes play a vital role in human nutrition due to their richness in protein, essential minerals, and vitamins. Among them, peanut (*Arachis hypogaea* L.) is an important legume oilseed crop, also known as earth nut, monkey nut, and goober. Locally, it is called *Pali* or *Mumpali* in Pashto and *Badam-e-zamini* in Dari. It is 13th most important crop globally, the 4th major source of vegetable oil, and the 3^{ed} key source of vegetable protein. Peanut seeds contain approximately 42-52% high quality edible oil, 25-32% digestible protein, and 20% carbohydrates. They are also rich in vitamins E, K, and B, especially thiamin (B1). The main storage proteins are arachin and conarachin, while the predominant amino acids include glutamic acid (22–27%), arginine (11–13%), and aspartic acid (8–13%). Peanuts are cultivated on about 31.57 million hectares worldwide, yielding 53.64 million tones, with an average productivity of 1.691 t/ha. Nevertheless, declining soil fertility due to continuous cultivation with limited fertilizer input remains a major challenge for sustainable production (Hershfield, 2019; Choudhary *et al.*, 2015; Ayoola *et al.*, 2012).

Chemical fertilizers play a vital role in enhancing Chemical fertilizers are essential for improving plant growth, increasing yields, and maintaining soil fertility. Yet, improper use especially of phosphorus and nitrogen can negatively affect plant development. Phosphorus is crucial for legumes as it supports energy transfer (ATP), seed development, biomass production, nodule formation, and grain yield. Despite its importance, about 49.3% of cultivated land is phosphorus-deficient, with only 1–3% of total soil phosphorus available to plants. Biological nitrogen fixation is a sustainable, cost-effective, and environmentally friendly alternative to chemical nitrogen, particularly for resource limited farmers. For example, peanuts can fix approximately 150–250 kg of nitrogen per hectare, providing residual benefits to subsequent crops. Moreover, integrating organic manures such as farmyard manure (FYM) and poultry manure (PM) improves soil structure and microbial activity, while inorganic fertilizers supply readily available nutrients. Combining organic and inorganic fertilizers provides balanced nutrition, enhances soil health, and increases crop productivity (Sharma *et al*., 2018; Kulkarni *et al*., 2018; Reddy *et al*., 2018; Zhou *et al*., 2020).

In Afghanistan, where agro climatic conditions vary widely, research on integrated nutrient management for peanut cultivation remains limited. Therefore, this study titled "Effects of Organic and Inorganic Fertilizers on the Growth and Yield of Peanut" aims to develop sustainable fertilization strategies tailored to local conditions to improve productivity and promote environmentally friendly peanut farming. The objectives of the study are to evaluate the effects of organic and inorganic fertilizers on the growth and yield components of peanut, assess the impact of different fertilizer applications on yield, and analyze the economics of each treatment.

MATERIALS AND METHODS

Site description

This study was conducted in June 2024 in Hakeem Abad, Khogyani District, Nangarhar, Afghanistan, located 38 km south of Jalalabad at 34.236682°N, 70.180745°E, with an elevation of 1285.22 m. The experiment followed a Randomized Complete Block Design (RCBD) with three replications and ten treatments, using the local Zarati peanut variety, widely cultivated in eastern Afghanistan and sourced from local farmers. The field was plowed to a depth of 25–30 cm using a 240 Massey Ferguson tractor, followed by harrowing and leveling. Peanut seeds (70 kg/ha) were sown in line with 15 cm spacing between plants and 30 cm between rows. Each plot covered 5.28 m², with a total planting area of 262 m².

Climate and weather conditions

The climate of this region is classified as Subtropical steppe type and falls under Semi-Arid Region. In generally, Steppe climates usually have hot summers and cold winters, with significant temperature variations between day and night. In a subtropical steppe climate, the lowest temperatures typically occur during the winter months, particularly in December, January, and February. During these months, temperatures can drop to around 0°C (32°F) or slightly below, especially at night, but they generally remain above freezing during the day. The highest temperatures are usually experienced in the summer months, particularly in June, July, and August. Daytime temperatures during these months can often reach above 35°C (95°F), and in some regions, they can exceed 40°C (104°F). The summer is marked by hot and dry conditions with little to no rainfall, which is characteristic of the subtropical steppe climate. The standard monthly meteorological data for the period of this investigation recorded at the Afghanistan Metrological Deportment Historical Data Sheet of Jalalabad are mentioned in table 1 and graphically showed in Fig 1.

Table 1 Monthly metrological data recorded during the period of experiment.

Month	**Mean Temperature (°C)**		**Mean RH (%)**	**Rainfall (mm)**
	Max (°C)	**Min (°C)**		
Jan	13.9	1.9	67	9
Feb	14.8	4.9	58	39
Mar	19.3	9	59	60
Apr	21.7	10.9	66	23
May	30.3	22.4	46	1.5
Jun	34.33	22.36	42	0
Jul	34.03	22.86	54	55
Aug	31.80	23.03	60	13
Sep	30.73	21.83	54	2
Oct	28.06	14.87	59	7
Nov	20.1	9.2	63	0
Dec	15.2	2.1	60	1
Mean	**24.52**	**13.78**	**57.33**	**17.54**
Total annual rainfall (mm) =				**426.5**

Source: Afghanistan Meteorological Department, Historical Data Sheet: Jalalabad, Nangarhar province.
Max. = Maximum, Min. = Minimum, RH= Relative humidity, mm = Millimeter

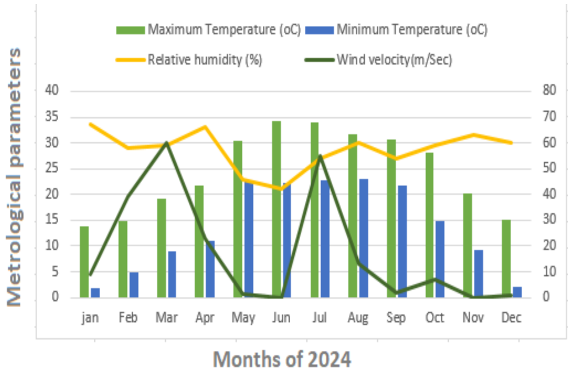

Figure 1 Metrological data recorded for the period of experiment at Nangarhar- Khogyani-Hakeem Abad during Jan- Dec 2024.

Experiment and treatments details

The experiment was conducted in 10 treatments and 3 replications. Each grass plot covered 5.28 m², while the total experimental area was 262 m². The treatments were T_1 (Control or no fertilizer), T_2 (Farmyard Manure), T_3 (Poultry Manure), T_4 (50% NP), T_5 (100% NP), T_6 (50% NP + FYM), T_7 (100% NP + FYM), T_8 (50% NP + PM), T_9 (100% NP + PM), and T_{10} (50% NP + FYM + PM).

Soil Analysis

The experimental site had a level surface, a moderate slope, and good drainage. Prior to designing, soil samples were obtained at random from various points in the area at depths of 15 to 30 cm. A composite sample was then created and examined to determine the soil's physical and chemical qualities. Table 2 presents the outcomes of these studies, as well as the methods used.

Table 2. Physio-chemical properties of the experimental field

No.	Particulars	Soil depth (cm)	Methods of Analysis
		15-30	
	Physical composition:		
a) b) c) d)	Sand (%) Silt (%) Clay (%) Texture class	57.2 16 26.8 Sandy clay Loam	pipette method (Piper,1966).
	Chemical parameters:		
e)	Soil pH (1:2:5 Soil: Water ratio)	6.66	Potentiometric pH meter (Jackson, 1973)
f)	Organic carbon (kg/ha)	18,270	Wet oxidation (Jackson, 1973)
g)	Available N (kg/ha)	94.08	Alkaline permanganate method Subbiah and Asija (1956)
h)	Available P_2O_5 (kg/ha)	35.4	Spectrophotometric (0.5M NaHCO3, pH 8.5) Olsen et al., (1954)
i)	Available K_2O (kg/ha)	170	Flame photometer method (Jackson, 1973).

The soil properties of the research field was sandy clay loam and low acidic in pH. Soil organic carbon ratio is medium and lower in available nitrogen, on the other side optimum in available phosphorus and potassium status.

Plant height (cm*)*

At the initial growth stage plants were selected randomly from each plots also got use of measuring tape or ruler to measure the plant height from soil surface (base) to the top of the stem (highest point of plant) on the one hand recorded height in centimeters and data were collected simultaneously at three interval and gaps 30-60 days after sowing (DAS) and at harvest after planting. The average heights were subsequently recorded in an Excel spreadsheet.

Number of branches

As five plants were selected so the branches of these plants were counted randomly by hand every 30 to 60 DAS and at harvest, and their averages were recorded in the excel sheet.

Number of leaves per plant

The leaves of five selected plants in each plots were counted by hand every 30 to 60 DAS, and at harvest stage, also the average were recorded in an excel sheet for analysis.

Number of pods per plant

At the harvest stage five randomly pre marked plants were counted and the average of this was taken per number of pods per plant also the calculation of average was based on the division of five and recorded accordingly in the excel sheet.

Number of seeds per pod

We selected 15 pods from each treatment or plot and divided the corresponding seeds into 15 groups, based on which we determined the number of seeds per pod. by the (Donald 1962 and Evans 1975).

Yield ton/ha

Peanut plants were planted in seven rows, resulting in a plot area of 5.28 m². Each row contained 14 peanut plants with a spacing of 15 cm between rows. For yield estimation, only the middle three rows comprising 30 plants were harvested, and the yield per hectare was calculated accordingly.

Straw yield ton/ha

Since peanuts are not only cultivated for food and economic benefits but also serve as an important source of animal feed, it was deemed necessary to measure the weight of the dried plants. Thirty plants from each plot were initially air dried at room temperature and then oven dried at 60–70 °C for 24 hours. The total straw yield per hectare was subsequently calculated and recorded for further analysis.

Economics Analysis

To estimate the most impactful and profitable treatment the relative economics of each cultivated treatment was controlled in terms of gross and net return and benefit cost ratio (BCR) according to the procedures developed by CIMMYT, (1988).

Statistical Analysis

In this portion of research using one-way analysis variance (ANOVA) the data were calculated and examined with IBM SPSS statistics 26 software. The post hoc DMRT test was applied to fine out any dissimilarities among treatment means at significance level of 0.05 percent. (Fisher., 1925).

RESULTS

Growth Parameters

Statistical analysis showed significant differences in plant height, number of branches, and number of leaves per plant between the control plot and the plots treated with organic and inorganic fertilizers (Table 3).

Plant Height (cm): No significant differences were observed during the first 30 days. However, at 60 days and harvest, notable variations appeared. The highest plant height (107.6 cm) was recorded in T_{10} (50% NP + FYM + PM), while the lowest (71.5 cm) was in the control (Table 3).

Table 3. Effect of organic and inorganic fertilizer on Plant height.

Treatment	Plant height (cm)		
	30 DAS	60 DAS	At harvest
T_1	31.0 ± 6.0	69.3 ± 11.3 ^{c}	71.5 ± 8.5 ^{d}
T_2	32.5 ± 1.7	78.2 ± 11.6 ^{bc}	79.4 ± 8.2 ^{cd}
T_3	32.3 ± 5.5	78.0 ± 9.7 ^{bc}	80.7 ± 8.6 ^{cd}
T_4	31.8 ± 4.4	81.3 ± 9.6 $^{a-c}$	83.2 ± 6.3 ^{cd}
T_5	32.5 ± 5.3	81.6 ± 9.8 $^{a-c}$	89.0 ± 10.2 ^{bc}
T_6	30.2 ± 6.5	81.0 ± 9.0 ^{bc}	89.4 ± 7.9 ^{bc}
T_7	31.4 ± 5.4	88.3 ± 6.1 ^{ab}	98.4 ±10.9 ^{ab}
T_8	35.3 ± 4.7	86.0 ± 8.9 ^{ab}	89.7 ± 7.7 ^{bc}
T_9	34.3 ± 4.0	89.9 ± 4.6 ^{ab}	100.3 ± 9.6 ^{ab}
T_{10}	34.5 ± 5.5	95.0 ± 5.5 ^{a}	107.6 ± 11.7 ^{a}
P – value	Ns	***	***
S.Em. (±)	1.72	3.4	3.13
C.D 5%	Ns	10.1	9.31

The data are presented as means (n = 9). Significant differences between treatments and control are analyzed using the Tukey test by letters. Asterisks *** denote p-values of <0.001, respectively. 'Ns' indicates not significant.

Number of Branches per plant: No significant differences were observed during the 30 and 60 DAS. At harvest, the highest number of branches (7.6) was recorded in the 10th treatment (50% NP + FYM + PM), followed by the 7th treatment (7.5), and the 9th and 5th treatments (7.3 branches each). The control treatment, where no fertilizers were applied, had the lowest number of branches (5.7). This increase in the number of branches at harvest can be attributed to the combined nutrient supply from organic manures (FYM + PM), and inorganic fertilizers (Nitrogen and phosphorus) which readily available to plant and from this plant can easily uptake of nitrogen which results to stimulate the cell division in meristem tissue and an increase in the number of branches per plant.

Table 4. Effect of organic and inorganic fertilizer on No. of branches/plant of peanut.

The data are presented as means (n = 9). Significant differences between treatments and control are analyzed using the Tukey test by letters.

Treatment	No. of branches/plant		
	30 DAS	60 DAS	At harvest
T_1	5.4 ± 1.0	5.4 ± 1.4	5.7 ± 1.3 ^{b}
T_2	5.0 ± 1.3	5.7 ± 1.2	6.7 ± 1.4 ^{ab}
T_3	5.0 ± 1.8	5.7 ± 1.2	6.2 ± 1.0 ^{ab}
T_4	4.7 ± 1.7	5.7 ± 0.8	6.0 ± 0.8 ^{ab}
T_5	4.2 ± 1.1	6.0 ± 1.1	7.3 ± 1.2 ^{ab}
T_6	4.3 ± 1.1	6.3 ± 1.1	6.7 ± 1.2 ^{ab}
T_7	4.1 ± 1.1	6.1 ± 1.3	7.5 ± 1.0 ^{ab}
T_8	4.4 ± 0.8	6.2 ± 1.4	6.6 ± 1.2 ^{ab}
T_9	4.4 ± 1.1	6.0 ± 1.4	7.3 ± 1.1 ^{ab}
T_{10}	5.5 ± 1.1	6.3 ± 1.0	7.6 ± 1.2 ^{a}
P – value	Ns	Ns	**
S.Em. (±)	0.25	0.39	0.33
C.D 5%	Ns	Ns	0.98

Asterisks **, denote p-values of <0.01, respectively. 'Ns' indicates not significant.

Number of leaves per plant: Application of organic and inorganic fertilizers significantly impacted the number of leaves on peanut plants at various growth stages, example 30 days, 60 days, and at the harvest stages. At 30 days, the highest number of leaves was observed in the treatment of 100% NP+ PM (46 leaves) and the 10th treatment which used 50% NP + FYM + PM (46 leaves), while lowest number of leaves (31 leaves) was recorded in control treatment. At 60 days, the 10th treatment showed the highest number of leaves (80 leaves), followed by the 9th treatment (79 leaves) and the 7th treatment (75 leaves). The control treatment again had the lowest number of leaves, with 54 leaves recorded. At the harvest stage, the maximum number of leaves was observed in the 7th treatment (96 leaves), followed by the 9th treatment (88 leaves) and the 10th treatment (84 leaves). The control treatment had the lowest number of leaves, with 60 leaves (Table 5).

Table 5. Effect of organic and inorganic fertilizer on No. of leaves/plant of peanut.

The data are presented as means (n = 9). Significant differences between treatments and control are analyzed using the Tukey test

Treatment	No. of leaves/plant		
	30 DAS	60 DAS	At harvest
T_1	30.6 ± 10.0 ^{b}	54.3 ± 5.9 ^{d}	59.7 ± 9.12 ^{e}
T_2	36.7 ± 6.4 ^{ab}	59.5 ± 7.8 $^{b-d}$	66.4 ± 12.5 ^{de}
T_3	39.2 ± 10.0 ^{ab}	57.0 ± 11.8 ^{cd}	68.4 ± 11.4 $^{c-e}$
T_4	37.0 ± 5.3 ^{ab}	64.7 ± 6.1 $^{a-d}$	67.4 ± 6.4 ^{de}
T_5	40.0 ± 5.7 ^{ab}	72.0 ± 11.8 $^{a-c}$	77.4 ± 11.5 $^{b-d}$
T_6	36.2 ± 6.2 ^{ab}	66.4 ± 11.5 $^{a-d}$	76.0 ± 9.7 $^{b-e}$
T_7	36.8 ± 6.3 ^{ab}	74.7 ± 9.8 ^{ab}	84.0 ± 11.3 $^{a-c}$
T_8	39.3 ± 5.0 ^{ab}	62.1 ± 16.5 $^{b-d}$	78.1 ± 8.4 $^{b-d}$
T_9	46.1 ± 8.9 ^{a}	79.2 ± 10. 40 ^{a}	88.2 ± 12.4 ^{ab}
T_{10}	45.6 ± 4.8 ^{a}	80.2 ± 8.83 ^{a}	96.3 ± 11.2 ^{a}
P – value	**	***	***
S.Em. (±)	2.54	3.72	3.15
C.D 5%	7.54	11.05	9.36

by letters. Asterisks **, and *** denote p-values of <0.01, and <0.001, respectively.

Number of pods per plant : The highest number of pods per plant (46) was recorded in the 10th treatment (50% NP + 20 t/ha FYM + 10 t/ha PM), followed by the 9th treatment (39.78 pods) and the 7th treatment (36 pods). The control treatment had the lowest pod count. Similarly, the maximum number of seeds per pod (3.4) was observed in the 10th and 9th treatments**,** showing the positive impact of combined organic and inorganic fertilizers (Table 6).

Number of seed per pod: The number of seeds per pod in peanut was significantly affected by fertilizer treatments. The highest value (3.4) was recorded in treatments 9 and 10, which included combinations of NP, FYM, and PM. Other treatments also showed clear differences (Table 6).

Straw Yield ton per hectare*:* Straw yield was also significantly influenced by fertilizer application. The 9th treatment recorded the highest yield (9.1 t/ha), followed by the 10th and 7th treatments (8.9 t/ha). The lowest straw yield (1.3 t/ha) was recorded in the control treatment, indicating the importance of balanced fertilization for biomass production.

Pod Yield ton per Hectare: Significant differences **(**P<0.05) were observed in pod yield among treatments. The 10th treatment recorded the highest yield (4.0 t/ha)**,** followed by the 7th treatment (3.8 t/ha) and the 9th treatment (3.6 t/ha)**.** The control treatment had the lowest yield, confirming the essential role of fertilization in maximizing peanut productivity (Table 6).

Table 6. Effect of organic and inorganic fertilizer on No. of pods, No. of seed, straw yield and total yield of peanut.

Treatment	No. of pods/plant	Number of seed per pod	Straw yield t/ha	Total yield t/ha
T_1	19.7 ± 5.1 ^{e}	2.5 ± 0.08 ^{c}	4.7 ± 0.33 ^{d}	1.3 ± 0.26 ^{b}
T_2	24.7 ± 5.5 ^{de}	2.7 ± 0.10 ^{bc}	5.8 ± 0.33 ^{cd}	2.7 ± 0.86 ^{ab}
T_3	29.4 ± 8.2 ^{cd}	2.7 ± 0.04 ^{bc}	6.0 ± 0.34 ^{cd}	2.8 ± 0.68 ^{ab}
T_4	25.7 ± 6.5 ^{de}	2.7 ± 0.06 ^{bc}	5.6 ± 0.58 ^{cd}	2.3 ± 0.36 ^{c}
T_5	29.1 ± 2.6 ^{cd}	3.1 ± 0.06 ^{ab}	6.5 ± 0.63 ^{bc}	2.5 ± 0.83 ^{c}
T_6	34.8 ± 5.1 ^{bc}	3.1 ± 0.25 ^{ab}	7.9 ± 0.64 ^{ab}	3.1 ± 0.75 ^{bc}
T_7	36.0 ± 7.0 ^{bc}	3.3 ± 0.21 ^{a}	8.9 ± 0.33 ^{a}	3.8 ± 0.24 ^{b}
T_8	35.8 ± 4.3 ^{bc}	2.7 ± 0.37 ^{bc}	7.8 ± 0.48 ^{ab}	3.2 ± 0.18 ^{bc}
T_9	39.7 ± 3.1 ^{ab}	3.4 ± 0.12 ^{a}	9.1 ± 0.24 ^{a}	3.6 ± 0.36 ^{b}
T_{10}	46.0 ± 4.4 ^{a}	3.4 ± 0.15 ^{a}	8.9 ± 1.35 ^{a}	4.7 ± 0.69 ^{a}
P – value	***	**	**	**
SEm±	2.24	0.1	0.34	0.21
C.D 5%	6.64	0.29	1.02	0.63

The data are presented as means (n = 9) with standard deviations. Significant differences between treatments and control are analyzed using the Tukey test by letters. Asterisks **, and *** denote p-values of <0.01, and <0.001, respectively.

Economic Analysis (Benefit-Cost Ratio): The T_{10} treatment emerged as the most economic, with a B:C ratio of 4.7, meaning every Afghani invested yielded 4.7 Afghanis in return. The 7th treatment was the second most profitable (B:C ratio of 4.6). These results highlight the economic advantages of integrating organic and inorganic fertilizers. (Pig 2).

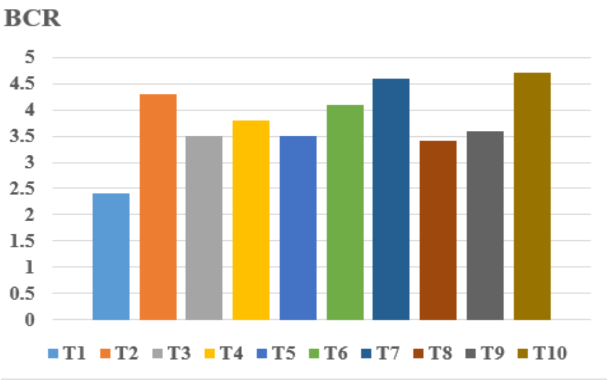

Fig 2: Effect of organic and inorganic fertilizers on Benefit Cost Ratio (BCR) of peanut.

DISCUSSION

The increase in plant height (107.6 cm in T_{10}) with fertilizer application is due to improved soil fertility, water use efficiency, and root development. Organic fertilizers enhance soil CEC and nutrient availability, but their combination with inorganic fertilizers ensures balanced nutrition for better growth (Mohanty *et al.*, 2022; Kumar *et al.*, 2012; Purbajanti *et al.*, 2019). The higher number of branches (7.6 in T_{10}) resulted from improved nutrient uptake from FYM, PM, and NP fertilizers, stimulating meristematic cell division (Zalate & Padmani, 2009; Akbari *et al.*, 2011; Liu *et al.*, 2023). Leaf production, crucial for photosynthesis, significantly increased at later stages (96 leaves in T_7) due to enhanced nitrogen availability and leaf area index, leading to better light interception and plant vigor (Mohanty *et al.*, 2022; Kumar *et al.*, 2012; Nazir *et al.*, 2022).

The combination of organic and inorganic fertilizers significantly influenced plant growth by enhancing dry matter accumulation, which in turn facilitated the efficient translocation of photosynthesis towards the sink, ultimately resulting in a higher number of pods per plant. This increase in pod formation can be attributed to improved soil physical conditions and nutrient availability (Sajid *et al.*, 2011; Chaudhary *et al.*, 2015).

Integrated use of organic and inorganic fertilizers improved nutrient availability and soil conditions, leading to higher pod number and yield per hectare in peanut. These findings support the benefits of combined nutrient management for enhanced productivity and align with earlier studies (Kumar *et al.*, 2012; Mathivanan *et al.*, 2014; Bhutadiya *et al.*, 2019).

Among the different fertilizer treatments, the combination of FYM (20 t/ha) + PM (10 t/ha) + 50% NP was particularly effective in improving peanut yield. These improvements were primarily due to the balanced nutrition, favorable soil environment, and optimal growing conditions provided by the fertilizers, which ultimately resulted in maximum yield potential. Similar trends have been observed, further confirming the significance of integrated nutrient management (Chaudhary *et al.*, 2015; Bhutadiya *et al*., 2019).

Consequently, the results clearly indicate that for obtaining high-quality peanut pods and maximizing straw yield, fertilizer application based on soil test values plays a crucial role (Kulkarni *et al*., 2018).

CONCLUSION

This study demonstrated that the combined application of organic and inorganic fertilizers significantly improved peanut growth, yield. The 10th treatment (50% NP + FYM + PM) showed the highest values for plant height, number of leaves, number of branches, and nodules per plant. Regarding yield components, this treatment also recorded the maximum number of pods per plant, seeds per pod, similarly the pod and straw yield was significantly higher in mentioned treatment. In contrast, the control treatment had the lowest productivity and profitability. These findings emphasize the effectiveness of integrating organic and inorganic fertilizers to enhance peanut production sustainably while maximizing economic benefits.

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Authors contributions:
Conceptualization, methodology, software, analysis, investigation, resources, original draft preparation, review and editing, visualization, supervision, project administration and funding acquisition. All authors have read and agreed to the published version of the manuscript.

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