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**Abdul Wahid Baghlani**
MSc., Head of Agriculture and Livestock Department, Kabul University, Afghanistan

**Mobin Alefzai**
MSc., Agriculture Program Coordinator, Kabul University, Afghanistan

**Hikmatullah Hussainee**
MSc, Agriculture Program Coordinator, Kabul University, Afghanistan

**Mohammad Daud Haidari**
Associate Professor and HOD, Department of Soil Science, and Irrigation Department Kabul University, Afghanistan

**Corresponding Author:**
**Abdul Wahid Baghlani**
MSc., Head of Agriculture and Livestock Department, Kabul University, Afghanistan

# Influence of poultry manure level compared to nutrient-rich organic fertilizer on growth and yield of mung bean (*Vigna radiate* L.)

**Abdul Wahid Baghlani, Mobin Alefzai, Hikmatullah Hussainee and Mohammad Daud Haidari**

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## Abstract
Mung Bean is an important crop in Afghanistan, serving as a staple food for its people. However, due to low soil fertility, farmers in Afghanistan are experiencing decreased incomes. As a result, they have resorted to high usage of chemical fertilizers, causing pollution to the environment and underground water. This study aimed to determine the optimal level of Poultry Manure compared to nutrient-rich organic fertilizer for the growth and yield of Mung Bean (*Vigna radiata* L.), as an alternative to reducing chemical fertilizer usage.

The research was conducted at the research farm of Kabul University during the summer season of 2022, using two separate experiments. In these experiments, different combinations of two types of poultry manure, NROF (Nutrient Rich Organic Fertilizer) and OF (Organic Fertilizer), were compared. The study included treatments such as Control, $T_1$ (no poultry manure), $T_2$ (poultry manure @ 700 kg NROF/ha), $T_3$ (poultry manure @ 1000 kg OF/ha), and $T_4$ (poultry manure @ 1500 kg OF/ha).

Data collected from the experiments were statistically analyzed using analysis of variance (ANOVA) and adjusted for mean differences using the Least Significance Difference (LSD) test at 5% and 1% probability levels. The results indicated that the different combinations of NROF and OF significantly influenced the growth and yield parameters of Mung Bean at harvest.

The treatment with no poultry manure (No) yielded the lowest results for these parameters, while the highest values were recorded in $T_4$ (poultry manure @ 1500 kg OF/ha), which showed statistical similarity to $T_2$ (poultry manure @ 700 kg NROF/ha) in most cases, followed by $T_3$ (poultry manure @ 1000 kg OF/ha). $T_4$ (1500 kg OF/ha) produced the tallest plants (44.17 cm), the maximum number of leaves per plant (45.17), the highest number of branches per plant (26.11), the greatest number of pods per plant (23.50), the highest number of seeds per pod (14.08), the highest 1000-seed weight (51.17 g), and the highest seed yield (1213.33 kg/ha) among the combinations in the two experiments conducted in 2022.

These results were statistically similar to $T_2$ (700 kg NROF/ha) in most parameters, while the Control treatment ($T_1$) with no poultry manure yielded the minimum grain yield. There were significant differences between $T_4$ and $T_1$, but no significant differences between $T_2$ and $T_3$.

**Keywords:** Mung bean, pollution, chemical fertilizer, organic fertilizer

## Introduction
Mung bean (*Vigna radiata* (L.) Wilczek) is an important pulse crop grown in Afghanistan. It belongs to the papilionoid subfamily of the Fabaceae family and is a self-pollinated herbaceous annual (Kang *et al.*, 2014) [39]. A research study conducted by Korean experts in Nangarhar province aimed to assess its economic efficiency and commercial potential. Mung bean, also known as mash, is used as human food and animal feed in Afghanistan. The recent research project in Nangarhar province yielded positive results. However, the yield per acre is significantly lower in Afghanistan (30-40 cents per acre) compared to other countries. The edible grain of the mung bean is known for its digestibility, flavor, high protein content, and lack of flatulence effects. It contains 24.7% protein, 0.6% fats, 0.9% fiber, and 3.7% ash. Additionally, it provides sufficient quantities of calcium, phosphorus, and important vitamins.

Mung bean can be used as a cover crop before or after cereal crops, serving as good green manure. It is a nitrogen-fixing legume, contributing significant biomass (7.16 t biomass/ha) and nitrogen to the soil (ranging from 30 to 251 kg/ha) (Hoorman *et al*., 2009) [25]. The composition of split mung bean per 100g is as follows: protein 21.24g, fat 1.31g, minerals 3.48g, fiber 4.11g, carbohydrate 56.72g, energy 334 kcal, calcium 124 mg, phosphorus 326mg, and iron 4.42mg. Due to its affordability as a protein source, it is often called the "poor man's meat." Ranked third among pulse crops after wheat, maize, and rice, mung bean is grown in two seasons, spring and summer, by Afghan farmers. It is also used as fodder for livestock and as a green manure crop to enhance soil fertility.

Afghanistan has a rural population of around 33.2 million, with approximately 80 percent engaged in livestock and farming as their primary occupation. Mung bean is considered a crucial pulse crop in Afghanistan due to its short growth period, drought tolerance, and suitability to low rainfall areas. It fits well into the existing cropping patterns and climate conditions of the country. Mung bean is commonly grown in warm regions such as Kunduz, Helmand, Kandahar, Nangarhar, Parwan, Baghlan, Laghman, Takhar, and Kapisa. Afghanistan has low pulse production and relies on imports from neighboring countries. Increasing pulse production is necessary to meet the protein and oil requirements of the growing population. Mung bean is a warm-season crop that requires 90-120 frost-free days from planting to maturity (Karande *et al*., 2019) [29].

**Impact of (PM) on chemical and biochemical properties of soils**

Different types of organic manures, such as poultry manure, crop stubbles, animal urine, compost, and biochar, can be added to soil to increase the microbial population and improve soil health and sustainability. Poultry manure specifically refers to the feces of poultry birds used as organic fertilizer, especially for nitrogen-deficient soil. Compared to other animal manures, poultry manure contains higher levels of nitrogen, phosphorus, and potassium. Fresh poultry manure typically contains 0.8% potassium, 0.4-0.5% phosphorus, and 0.9-1.5% nitrogen. Each poultry chicken produces around 8-11 pounds of manure per month. Poultry manure is an excellent organic plant fertilizer due to its rich source of readily available nutrients and cost-effectiveness.

However, the excessive use of chemical fertilizers in recent years has caused environmental issues. Fertilizer application can lead to the accumulation of heavy metals in soil and plants, affecting water, soil, and air quality. While chemical fertilizers are necessary to meet crop nutrient requirements, the depletion of nutrients in the soil poses a significant threat to sustainable agriculture. Therefore, reducing the use of chemical fertilizers and increasing the utilization of organic manures is crucial. The application of organic manures, such as FYM, vermicompost, poultry manure, and oilcake, can improve soil physio-chemical properties and enhance the efficient use of applied fertilizers, resulting in higher seed yield and quality.

Organic manures improve soil structure, aeration, and water-holding capacity while stimulating microorganisms that facilitate the uptake of macro and micronutrients by plants through biological processes. Additionally, organic manures increase nutrient solubility and affect soil salinity, sodicity, and pH. The choice of organic manure impacts crop quantity and yield.

Numerous studies have shown the superiority of poultry manure compared to other organic alternatives, consistently yielding better results in organic farming. For instance, the application of 5 to 10 tons per hectare of poultry manure significantly increased the fresh and dry weight of mung bean crops. Mung bean was chosen as the focus of this investigation due to its advantages as a food source for humans and animals, particularly during the summer season when it matures quickly (approximately 90-120 days). Applying poultry manure to mung bean crops has been found to enhance dry matter at harvest, the number of pods per plant, seeds per pod, 1000-grain weight, seed yield, and total biomasss. Based on these considerations, this study aims to examine the effects of different levels of poultry manure compared to nutrient-rich organic fertilizer on the growth and yield of mung beans (*Vigna radiata* L.) under semi-arid conditions in Kabul, Afghanistan.

**Materials and Methods**

During the summer season from June 2022 to September 2022, an experiment called "Influence of Poultry Manure Level Compared to Nutrient-rich Organic Fertilizer on Growth and Yield of Mung Bean (*Vigna radiate* L.) (Mash 08) at Climatic Conditions of Kabul" was carried out at the Agriculture Faculty research farm of Kabul University. Two field experiments were conducted during this period.

This chapter provides information about the materials used and the techniques employed in the investigation.

**Location of Experimental Site**

The experimental site is located in Kabul, with geographical coordinates of 34.528° latitude, 69.172° longitude, and an elevation of approximately 1800 meters above sea level. The field chosen for the experiment had a uniform and fertile soil, as the same crop had been cultivated there in the previous season. The topography was even, and the soil texture was consistent throughout the site. Additionally, the field was conveniently connected to the main irrigation channel, which allowed for prompt and regular watering. Adequate drainage facilities were also in place to effectively remove excess water during the experimental period.

**Field Layout Details**

An experiment was conducted from 10 June to September 2022 to study the effects of different levels of poultry manure and nutrient-rich organic fertilizer on the growth and yield of Mung Bean (*Vigna radiate* L.). Four levels of poultry manure were tested: $T_1$ (Control, no poultry manure), $T_2$ (700 kg NROF/ha), $T_3$ (1000 kg OF/ha), and $T_4$ (1500 kg OF/ha). The experiment followed a Randomized Complete Block Design with three replications. Each plot measured 6m² (3.0 m x 2.0 m), and there were a total of 12 plots. The land was plowed twice and then leveled. On 10th June 2022, seeds were sown at a rate of 22.5 kg $ha^{-1}$, with a plant-to-plant distance of 20 cm and a line-to-line distance of 40 cm. The crops were harvested simultaneously when the pods reached full maturity. The harvested crop bundles were sun-dried for two days on the threshing floor. Seeds were separated from the plants by beating the bundles with bamboo sticks. The collected seeds were then sun-dried to reduce the moisture content to 12%. The dried and cleaned seeds were weighed. Before maturity, three plants were randomly selected from each plot for data recording. Data was collected on plant height, number of leaves per plant, number of branches per plant, number of pods per plant, number of seeds per pod, weight of thousand seeds per gram, and seed yield in kg per hectare. The Mung bean variety used in the experiment was obtained from the Research Directorate, Seed Department of

Badam Baghah Research Farm in Kabul, Afghanistan. Poultry manure was sourced from the Kabul Hazera Jot Terminal located at the end of the Dusty Beach area (Xir Biomass Company). Each plot contained one Mung bean variety (Mash 08) with three seed rates per hole. The field was plowed with a disc, then harrowed and ridged in a north-south direction after the previous crop was harvested, in both years of the experiment (2022). Borders, irrigation, and drainage channels were manually created for each replication. Water was introduced into the plots for bed preparation, and proper leveling of the plots was carried out before sowing. The field was divided into three blocks (replications).

**Table 1:** Details of field layout

| S. No. | Particulars | Description |
|---|---|---|
| 1. | Design of experiment | RCBD |
| 2. | No, of replication | 3 |
| 3. | Total number of treatments | 12 |
| 4. | No, of row per plot | 4 |
| 5. | Distance between rows | 40 |
| 6. | Plant-to-plant distance | 20 |
| 7. | Length of row | 2.6 m |
| 8. | Block border | 20 cm |
| 9. | Plot border | 20 cm |
| 10. | Gross plot size | 4 m.16 $m^2$ |
| 11. | No, of harvesting rows | 3 |
| 12. | Harvesting area | 1 $m^2$ |
| 13. | Total area | 17 $m^2$ |

### Soil sample
Before cultivation the land about 0 - 15 cm depth of the land was collected soil for Analysis of the data, then when the land mixed well the soil was collected for a composite Sample. After harvesting the crop some soil is collected, on 18th May 2020 around 0 - 15 cm depth. The samples were dried in the air and then sieved with a 2 mm (10 meshes) sieve for the next analysis.

### Soil properties
The soil, as a medium of plant support and growth, is bound to affect profoundly and substantially the rate of growth as well as development and eventually the final and economical yield through its biotic and abiotic activities and geo-physio-chemical properties. The composite samples from 0-30 cm depth were randomly collected from the experimental field with the help of an auger before experimentation. All the possible technical precautions as prescribed for standard soil sampling were also taken. Then samples were brought to the laboratory, air-dried and ground, and thereafter sieved through 20 mm mesh. The soil samples thus obtained were subjected to various mechanical, physical, and chemical analyses to assess the single-value physical and chemical properties of soil. (Table 1).

### Crop Sampling and Data Collection
Three plants from each treatment were randomly selected and uprooted at the different growth stages of the plant which was used for data recording. Data were recorded at 10 days intervals starting from 10 DAS to harvest. The following parameters were recorded during the study.

- Plant height (cm).
- Number of leaves plant$^{-1}$.
- Number of branches plant$^{-1}$.
- Number of pods plant$^{-1}$.
- Number of seeds pod$^{-1}$.
- Pod length (cm).
- 1000 seed weight (g).
- Seed yield (kg ha$^{-1}$).

### Plant Height
During the mung bean growing cycle, careful measurements are used to record the plant height. We measured the height of the plant using a tape measure. Use standard procedures to ensure accuracy. After random selection from each plot, the height of each plant was measured from the base of the plant to the tip of its longest leaf. All selected plants were measured multiple times to fully understand changes within and between treatment groups.

A spreadsheet containing data on plant pressure was then created for future research and interpretation. Number of branches per plant from three plants of Mung beans, the number of branches was counted and then the mean number of branches was recorded and counted as branches per plant.

### Number of Leaves per Plant
The numbers of green trifoliate leaves present on each plant were recorded manually from the randomly selected three plants at different growth stages (20 DAS, 40 DAS, 60 DAS, 80 DAS, and harvest). The mean number of leaves per plant was computed and expressed in number per plant.

### Number of Branches per Plant
The branches were counted from the 3 randomly selected plants at 40 DAS and harvest time and mean value were determined as branches per plant. One thousand cleaned and dried seeds were counted randomly from each treatment plot and weighed by using a digital electric balance and the weight was expressed in grams after harvest.

### Pods per Plant
Numbers of total pods of selected plants from each treatment were counted and the calculated mean numbers were expressed as per plant basis. Data were recorded as the average of 3 plants randomly collected from the marked rows of each plot.

### Seeds per Pod
The number of seeds per pod was calculated and recorded randomly from selected plants at the time of harvest. Data were recorded as the average of 20 pods selected at random from the harvested pod.

### Pod Length
Pod length was also taken of randomly selected twenty pods from the harvested pod of selected plant and the mean length was expressed on cm.

### Thousand Seeds Weight/gr
The thousand seed weight was measured to evaluate the influence of the level of poultry manure in comparison to nutrient-rich organic fertilizers on the weight of Mung bean seeds and the individual components. To get accurate and trustworthy measurements of the weight of the thousand seeds, a random sample of mature mungbean plants was selected from each treatment plot. The sample size was selected based on statistical recommendations to ensure appropriate representation. The selected mungbean plants' straw was carefully removed, taking care to remove any broken or crooked grains. A digital balance calibrated to within 0.01 grams was used to weigh each sample of 1,000 seeds. Every measurement was made three times to account for variability, and the average was calculated

for every plot.

To ensure consistency and lower errors, standardized protocols were adhered to at every stage of the process. Ingredients that deviate from the mean are thoroughly examined, and if required, they are eliminated from the final analysis.

Employing these meticulous measures, our ultimate goal is to produce dependable and precise data for analysis, enabling a more profound comprehension of the influence exerted by the plant group on maize grain and its derivatives.

**Seed Yield kg ha$^{-1}$**

A methodical sampling technique was applied to collect data measures to assess the Mung bean grain yield. The research area was divided into multiple plots, with each plot designating a different level of poultry manure with nutrient-rich organic fertilizer. From each plot, a certain number of sample plants were selected at random. The selected plants were cautiously picked at the maturity stage to determine the real grain yield. During the Harvesting procedure, the Mung bean plants in each sampled plot were laboriously picked and divided. The pods from the plants were manually gathered, meticulously cleaned, and let air dry to eliminate any remaining moisture. The dried Mung bean pods were shelled to extract the grains from the pods.

After being encased, the grains were meticulously and precisely weighed on a digital scale. The weight of each sample was recorded, and the weights of all the samples within a certain plot were added to estimate the grain production. The weighing process was repeated three times for each plot, and the average weight was utilized for analysis. This methodical approach to data collection enabled a comprehensive examination of the effects of DAP fertilizer on the production of mungbean grain and its parts, yielding reliable and significant study results.

Organic fertilizer was also reported to increase the number of pods per plant and seed yield of Mung beans (Moller, 2009; Abbas *et al*., 2011) [1].

**Harvesting**

Harvesting of the crops began when the greatest number of pods reached simultaneous maturity. 80% of the mature pods were manually picked the first 90 days following sowing, and the second harvest was completed seven days after the first. After that, the harvest from each net plot area was packed, labeled, and carried to the threshing floor to be threshed and sun-dried. Plot-wise, the plant was threshed by pounding it with a stick. Grain weight was calculated in kilograms per hectare and documented according to treatment. When the second pod was ready to be picked, all plants were finally harvested plot-wise by uprooting and bundling them individually. After that, every plant that had been harvested was marked and delivered to the Kabul farm and research's threshing floor. Finally, every harvested pod was stored separately in gunny bags with the appropriate tags. The mung bean harvests were ready to be harvested on October 15, 2020. Following agricultural harvesting, the crops are packed according to plot. Plot-wise, the grain was observed because those data are necessary for statistical analysis.

**Threshing and winnowing**

The harvested produce from each plot (1 m$^2$) was allowed to dry in the sun on the threshing floor and the bundles were weighed for biological yield. Seeds were separated from the plants by beating the bundles with bamboo sticks and collected seeds were sun dried up to lower the moisture content of seed at 12% level. From the dried and cleaned seed, the seed yield per plot was recorded and converted into kg/ ha.

**Statistical Analysis**

The data recorded for different parameters were statistically analyzed with the help of Statistic software to determine the significant dissimilation among several treatments on growth, yield, and yield contributing characters of Mung bean. The collected data were computed and analyzed statistically using the analysis of variance (ANOVA) technique and the mean differences were adjusted by the Least Significance Difference (LSD) test at 5% and 1% level of probability.

**Results**

The observations were made at various phases of crop growth, and the statistical analysis of the final data determined the amount of variance resulting from various types of treatments. For both years of study completed and combined at the proper places, tables, and charts are used to depict the pattern of crop plant behavior under various treatments.

**Effect of (PM) and (Nrof) on Plant Height (cm)**

In the first field of experiment, The Poultry manure and nutrient-rich organic fertilizer doses showed significant differences in the case of the Plant height. The highest plant height (45.6 cm at 60 DAS) was recorded from treatment $T_4$. The lowest plant height (26.7 cm) was obtained from $T_1$. In the second field of the experiment, the highest plant height (45. cm at 60 DAS) was recorded from treatment $T_2$. The lowest plant height (34.67 cm 60 DAS) was obtained from $T_1$. In the combination form of both fields, the plant height of Mung beans differed significantly due to the interaction effect of PM and Nrof. The highest plant height (44.17cm) was recorded from the combination of $T_4$ and the lowest plant height (30.33cm) was recorded from the combination of control treatments and no poultry manure $T_1$. Based on statistical analysis there is no significant difference among treatments at (5%) and (1%) levels control was different from the others as well and $T_4$ was different from $T_1$ but there was no difference between treatment $T_2$ and $T_3$. (Table 2 combines analysis of plant height mean) A combination of organic and inorganic fertilizers was found better in groundnut and green gram than only inorganic fertilizers.

The same results were also reported that the organic manure treatments, i.e. poultry manure @ 10 t/ha, composted poultry manure @ 10 t/ha, FYM @ 12.5 t/ha + poultry manure @ 5 t/ha, FYM @ 12.5 t/ha + composted poultry manure @ 5 t/ha provided better growth and yield of pulses crop over control (Amanullah *et al*., 2007) [5].

**Table 2:** Combine Analysis: plant height means.

| | Treatment | Means | Group |
|---|---|---|---|
| $T_1$ | Control | 30.33 | c |
| $T_2$ | Nrof 700 Kg / Ha | 42.00 | ab |
| $T_3$ | Poultry Manure 1000 Kg/Ha | 34.00 | bc |
| $T_4$ | Poultry Manure 1500 Kg/ Ha | 44.17 | a |
| LSD (5%) | | 8.16 | |
| Level of Significant | | ** | |
| CV (%) | | 17.25 | |

T = Treatment, LSD = Least Significant Difference, CV = Coefficient of Variation, means with the same letter are not significantly different

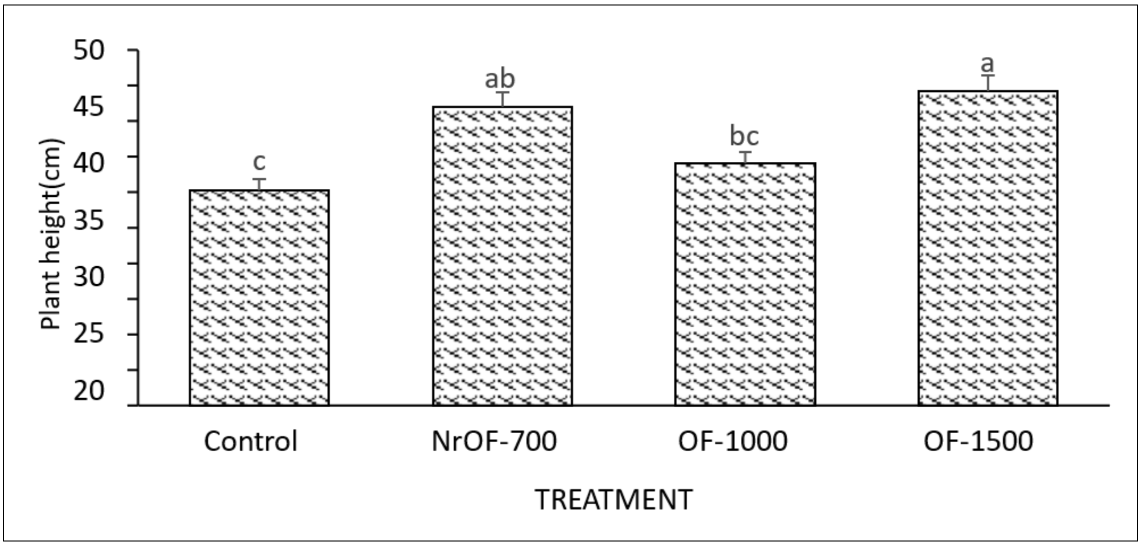


**Fig 1:** plant height at Mung bean as influenced by different levels of PM

**Effect of (PM) and Nrof on Leaves per Plant**

In the first field of experiment, the number of leaves per plant was significantly varied due to the application of different (PM) and (Nrof). The maximum number of leaves (35 at 60 DAS and harvest) was recorded under the treatment $T_4$. The lowest Number of leaves plant-1 (26 at 60 DAS and harvest) was recorded under the treatment $T_1$.

In the second field of the experiment, The maximum number of leaves (37 at 60 DAS and harvest) was recorded under the treatment. The lowest Number of leaves plant-1 (29 at 60 DAS and harvest) was recorded under the treatment $T_1$.

The combination form of both fields, the Leaves of Mung bean differed significantly due to the interaction effect of (PM) and (Nrof) treatments, the highest number of leaves (45.17) was recorded from the combination of $T_4$ and the lowest number of leaves (28.17) was recorded from the combination of control treatments no poultry manure $T_1$. Based on statistical analysis there is no significant difference among treatments at (5%) and (1%) levels control was different from the others as well and $T_4$ was different from $T_1$ but there was no difference between treatment $T_2$ and $T_4$ and also between $T_1$ and $T_3$ (Table 3 Combine Analysis number of leaves per plant means).

Similar results reported that the application of organic inputs significantly increased the growth, dry matter, and yield of mung bean.

**Table 3:** Combine Analysis: Number of leaves per plant means

| Treatment | Means | Group |
|---|---|---|
| $T_1$ control | 28.67 | b |
| $T_2$ Nrof 700 Kg / Ha | 39.17 | a |
| $T_3$ Poultry Manure 1000 Kg / Ha | 31.67 | b |
| $T_4$ Poultry Manure 1500 Kg / Ha | 45.17 | a |
| LSD (0.05) | 7.3887 | |
| Level of Significant | ** | |
| CV (%) | 16.24 | |

T = Treatment, LSD = Least Significant Difference, CV = Coefficient of Variation, means with the same letter are not significantly different

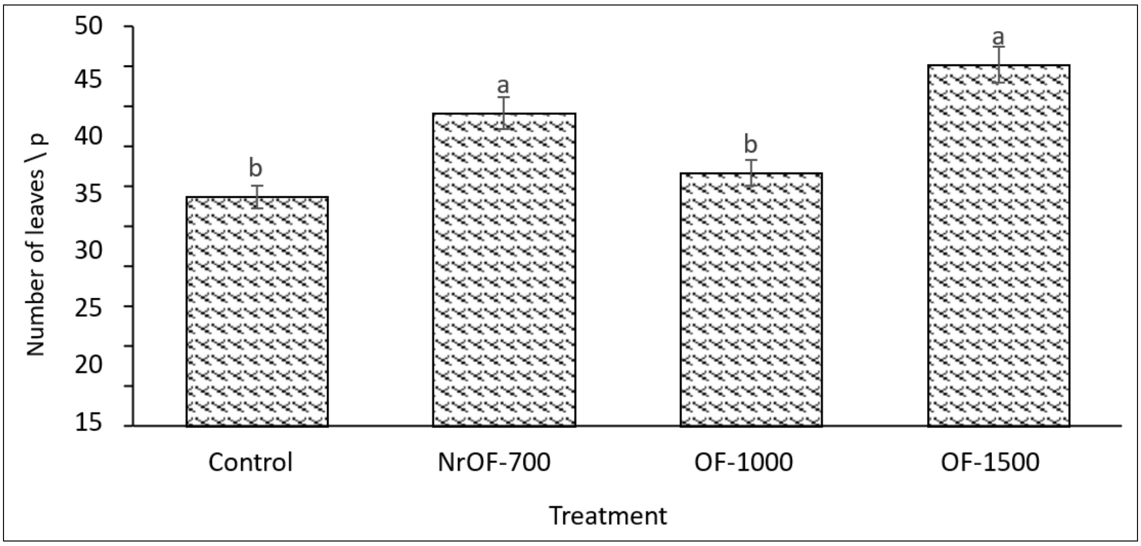


**Fig 2:** number of leaves at Mung bean as influenced by different levels of PM

**Effect of (PM) and (Nrof) on Pods per Plant**

In the first field of experiment, the (PM) and (Nrof) showed significant differences in the ease of the number of pods Plant$^{-1}$. The highest number of pods per plant (21.67) was acquired from the treatment $T_4$. The lowest number of pods per plant (16.22) was acquired from treatment $T_1$.

In the second field of the experiment, the highest number of pods per plant (25.33) was acquired from the treatment $T_4$ which was similar to the $T_2$ treatment. The lowest number of pods per plant (19.90) was acquired from treatment $T_1$.

The combination form of both fields and the number of pods per plant of Mung bean differed significantly due to the interaction effect of (PM) and (Nrof) treatments. The highest number of pods plant-1 (23.50) was recorded from the combination of $T_4$ and the lowest number of pods plan$T_1$ (18.08) was recorded from the combination of control treatments and no poultry manure $T_1$. Based on statistical analysis there is no significant difference among treatments at (5%) and (1%) levels control was different from the others as well and $T_4$ was different from $T_1$ but there was no difference among treatments $T_4$, $T_2$, $T_1$, and $T_3$ (Table 4 combine analysis Number of pods plant mean).

Similar results were also reported in mung bean. the application of poultry manure @ 15 t per ha to soybean recorded a significantly higher number of pods per plant (Aruna and Narsa Reddy, 1999) [10]. the application of poultry manure @ 2 t $ha^{-1}$ significantly higher the number of pods plant-1 of pigeon pea crop over control reported by (Ramesh *et al*., 2006) [40]. The application of poultry manure @ $5tha^{-1}$ significantly higher number of pods $plant^{-1}$ (18.6) in groundnut crops over control reported by (Rao and Shaktawat, 2002) [41].

**Table 4:** Combine Analysis: Number of pods plant means

| Treatment | Means | Group |
|---|---|---|
| $T_1$ control | 18.06 | c |
| $T_2$ Nrof700 Kg/ha | 22.43 | ab |
| $T_3$ Poultry Manure 1000 Kg /ha | 20.17 | bc |
| $T_4$ Poultry Manure 1500 Kg /ha | 23.50 | a |
| LSD (0.05) | 2.8849 | |
| Level of Significant | * | |
| CV (%) | 10.90 | |

T = Treatment, LSD = Least Significant Difference, CV = Coefficient of Variation, means with the same letter are not significantly different

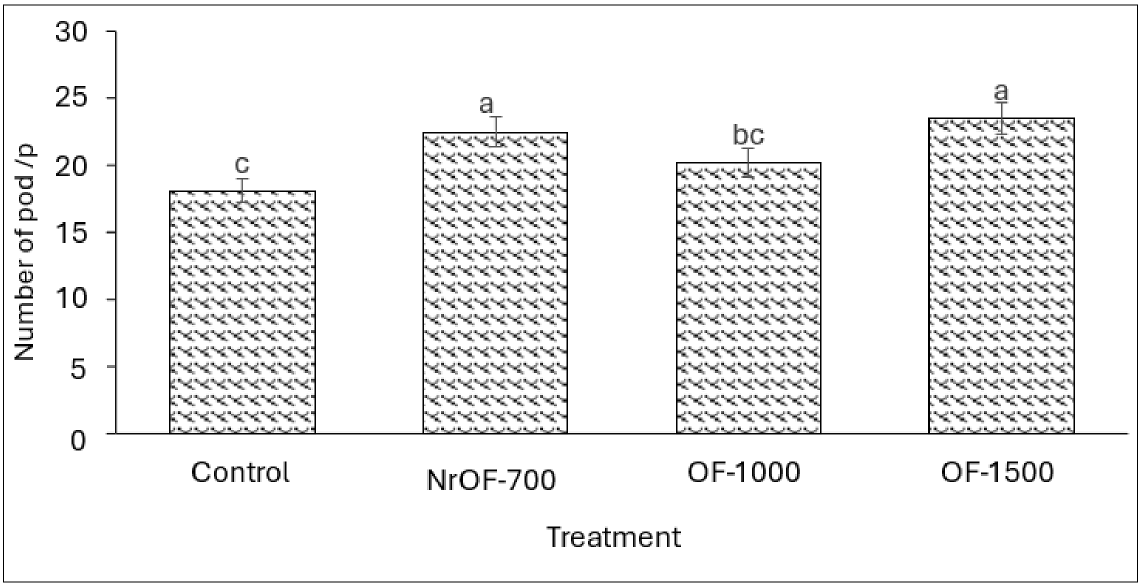


**Fig 3:** Number of pod -1 at Mung bean as influenced by different levels of PM

**Effect of (PM) and Nrof on Seeds per Pod**

In the first field of experiment, however, the (PM) and (Nrof) doses showed significant differences in the case of the number of seeds per Pod. The highest number of seeds per pod (14.33) was recorded in treatment $T_4$. Application of no poultry manure ($T_1$) gave the lowest number of seeds Pod-I (11.57) among the treatments. In the second field of the experiment Highest number of seeds per Pod (13.83) was recorded in the treatment $T_4$ which was statistically similar to $T_3$. Application of no poultry manure ($T_1$) gave the lowest number of seeds Pod-1 (11.77) among the treatments.

The combination form of both fields, the Application of different (PM) and (Nrof) demonstrated a significant effect on seed $pod^{-1}$ of Mung bean. Significant variation was observed on seed $pod^{-1}$ of Mung bean by the effect of different (PM) and (Nrof) applications. The highest no of seeds $pod^{-1}$ (14.08) was recorded from the combination of $T_4$, and the lowest seed $pod^{-1}$ (11.67) was recorded from the combination of control ($T_1$). Based on statistical analysis there is no significant difference among treatments at (5%) and (1%) levels control was different from the others as well and $T_4$ was different from $T_1$ but there was no difference between $T_3$, and $T_2$ treatments. (Table 5 combines analysis Number of seeds $pod^{-1}$ means.). This finding partially reported that the application of poultry manure influenced the no of seeds $pod^{-1}$ of cowpeas. Similar results were reported in groundnut and green gram.

**Table 5:** Combine Analysis number of seeds $pod^{-1}$ means.

| Treatment | Means | Group |
|---|---|---|
| $T_1$ control | 11.67 | c |
| $T_2$ Nrof700 Kg / Ha | 13.33 | b |
| $T_3$ Poultry Manure 1000 Kg / Ha | 12.83 | b |
| $T_4$ Poultry Manure 1500 Kg / Ha | 14.08 | a |
| LSD (0.05) | 1.0815 | |
| Level of Significant | ** | |
| Cv (%) | 6.63 | |

T = Treatment, LSD = Least Significant Difference, CV = Coefficient of Variation, means with the same letter are not significantly different

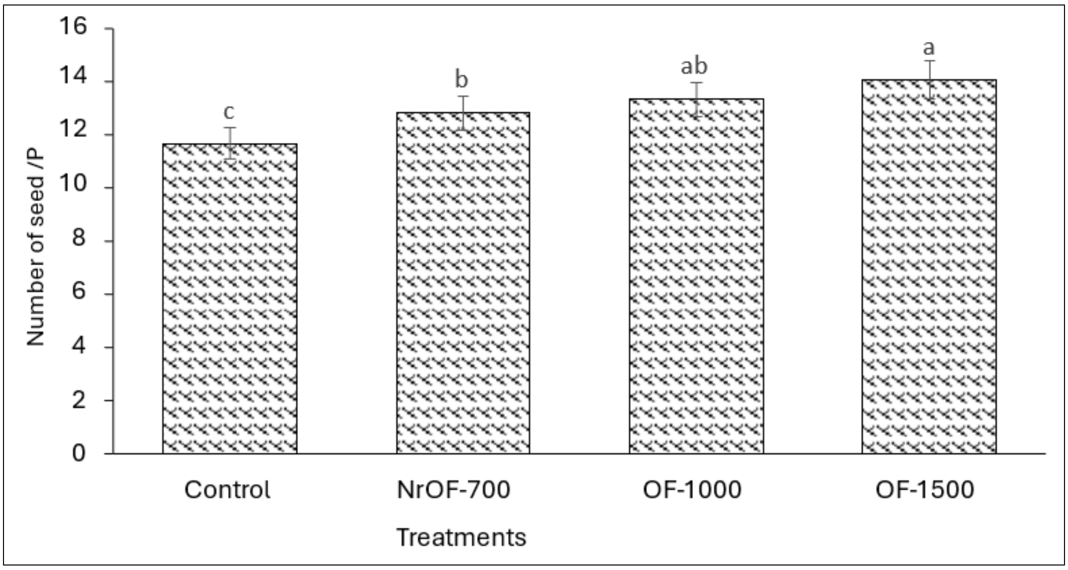


**Fig 4:** Number of seed pod $^{-1}$ at Mung bean as influenced by different levels of PM

**Effect of (PM) and Nrof on Thousand Seed Weight (gr)**

In the first field of experiment, Different doses of poultry manure showed significant differences in the case of 1000 seed weight/gr. The highest 1000-seed weight (48.67 g) was recorded in $T_4$ Application of 1000 kg ha$^{-1}$ poultry manure ($T_3$) showed the lowest 1000-seed weight (43.33 g) among the treatments.

In the second field of experiment The highest 1000-seed weight (53 g) was recorded in $T_4$ Application of no poultry manure ($T_1$) showed the lowest 1000-seed weight (42 g) among the treatments.

The combination form of both fields, the 1000 Seed weight of Mung bean differed significantly due to the interaction effect of (PM) and (Nrof). The highest 1000 Seed weight (51.17 g) was recorded from the combination of $T_4$ and the lowest 1000 Seed weight/ gr (40.67 g) was recorded from the combination of control treatments and no poultry manure $T_1$. Based on statistical analysis there is no significant difference among treatments at (5%) and (1%) levels control was different from the others as well and $T_4$ was different from $T_1$ but there was no difference between $T_3$, and $T_4$ treatments. (Table 6 combine analysis 1000. Seeds weight means).

It is revealed from the result that the Combination of poultry manure increased the 1000 seed weight. The application of poultry manure 2 t ha$^{-1}$ recorded significantly higher seed weight (4.14 g) in sunflowers (Chinnamuthu and Venkatakrishnan, 2001) [17].

**Table 6:** Combine Analysis 1000 Seeds weight means

| Treatment | Means | Group |
|---|---|---|
| $T_1$ Control | 40.67 | c |
| $T_2$ Nrof 700 Kg / Ha | 48.33 | ab |
| $T_3$ Poultry Manure 1000 Kg / Ha | 43.83 | b |
| $T_4$ Poultry Manure 1500 Kg / Ha | 51.17 | a |
| LSD (0.05) | 4.0027 | |
| Level of Significant | * | |
| CV (%) | 6.77 | |

T = Treatment, LSD = Least Significant Difference, CV = Coefficient of Variation, means with the same letter are not significantly different

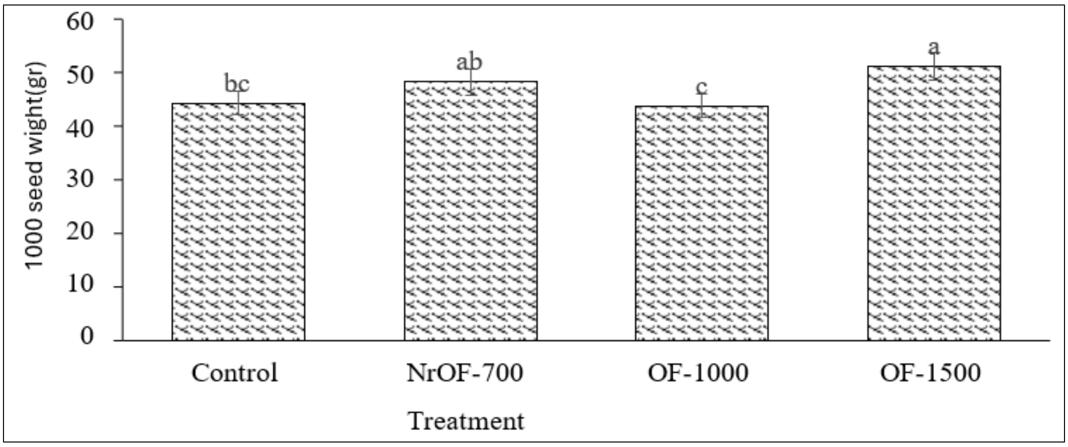


**Fig 5:** 1000 seed Wight at Mung bean as influenced by different levels of PM

**Effect of Different (PM) and (Nrof) on Seed Yield kg/ha**

In the first field of experiment, the Application of different (PM) and (Nrof) showed a significant effect on the seed yield of Mung bean. Among different (PM) and (Nrof) the highest Seed yield (1166 Kg /ha) was obtained from treatment $T_4$ and the lowest seed yield (503.33 Kg /ha) was obtained from treatment $T_1$.

In the second field of the experiment, the Application of different levels (PM) and (Nrof) showed a significant effect on the seed yield of Mung bean. Among different (PM) and (Nrof) the highest Seed yield (1260 Kg/ha) was obtained from treatment $T_4$ and the lowest seed yield (670 Kg /ha) was obtained from treatment $T_1$.

The combination form of both fields and the interaction effect of different (PM) and (Nrof) applications significantly affected the grain yield of Mung beans. The highest grain yield (1233.33 kg/ha) of Mung bean was recorded from the treatment combination of $T_4$ and the lowest grain yield (586.67 kg/ha) was recorded from the combination of control treatments with no poultry manure $T_1$. Based on statistical analysis there is no significant difference among treatments at (5%) and (1%) levels control was different from the others as well and $T_4$ was different from $T_1$ but there was no difference among $T_3$, $T_2$, $T_1$, and $T_4$ treatments. (Table 7 combines analysis of Seed yield means). Application of poultry manure @10 t per ha recorded higher seed yield (44 q per ha). Reported by (Roy & Singh, 2006) [42]. Application of poultry manure @15t per ha to soybean recorded a significant seed yield (1143 kg/ha). reported by (Aruna & Narsa Reddy, 1999) [10]. The application of DAP at 124 Kg along with 10 tons ha-I of poultry litter yielded the maximum seed yield ha-I reported by (Abbas *et al*., 2011) [1].

**Table 7:** Combine Analysis yield Kg/Ha means

| Treatment | Means | Group |
|---|---|---|
| $T_1$ control | 586.67 | b |
| $T_2$ Nrof 700 Kg / Ha | 946.67 | ab |
| $T_3$ poultry Manure 1000 Kg / Ha | 833.33 | b |
| $T_4$ poultry Manure 1500 Kg / Ha | 1213.33 | a |
| LSD (0.05) | 376.5215 | |
| Level of Significant | ** | |
| Cv | 33.44 | |

T = Treatment, LSD = Least Significant Difference, CV = Coefficient of Variation, means with the same letter are not significantly different

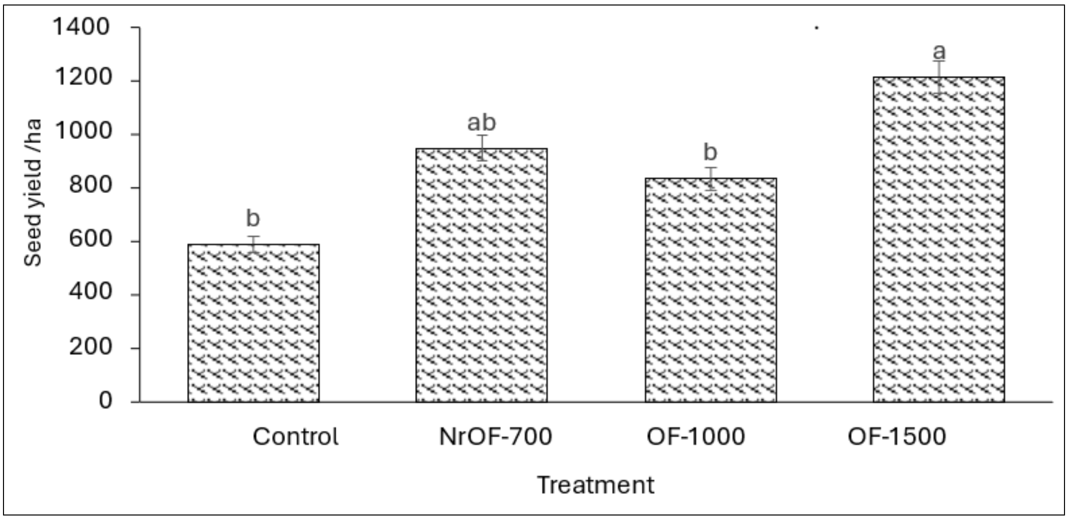


**Fig 6:** seed yield kg ha$^{-1}$ at Mung bean as influenced by different levels of PM.

## Discussion

### The plant height /(cm)

The plant height was significantly affected by poultry manure and Nrof rates, application of 1500kg ha$^{-1}$ poultry manure recorded significantly more plant height than control. Karmegam and Daniel (2000) found similar results in the ease of cowpeas by using organic manure.

These results agree that the application of organic manure treatments, i.e. poultry manure @ 10 t/ha, composted poultry manure @ 10 t/ha, FYM @ 12.5 t/ha + poultry manure @ 5 t/ha, FYM @ 12.5 t/ha + composted poultry manure @ 5 t/ha provided better growth and yield of pulses crop over control. (Amanullah *et al*., 2007) [5].

### Number of branches plant$^{-1}$

Several branches of plant$^{-1}$ influenced by poultry manure and Nrof rates were significant. Mung bean produces a higher number of branches under various applications of poultry manure fertilizer, the result of this investigation showed that the application of 1500 kg ha$^{-1}$ poultry manure revealed a maximum number of branch plant $^{-1}$ that was statistically significant compared to the control and 1000kg ha$^{-1}$ poultry manure.

These results are in agree that the application of vermicomposting resulted in a significant increase in the growth and yield of cowpeas.

### Number of leaves plant$^{-1}$

Number of leaves plant$^{-1}$ influenced by poultry manure rates was significant. Mung beans produce a higher number of leaves under various applications of poultry manure and nutrient-rich organic fertilizer, the result of this investigation showed that application of 1500 kg ha$^{-1}$ poultry manure revealed a maximum number of leaves plant $^{-1}$ that was statistically significant compared to control and 1000kg ha$^{-1}$ poultry manure.

These results are similar in that the application of organic inputs significantly increased the growth, dry matter, and yield of mung beans.

### Pods Length /cm

Pods Length influenced by poultry manure rates and (Nrof) were significant. Mung beans produce higher pod lengths under various applications of poultry manure fertilizer, the result of this investigation showed that the application of 1500 kg ha$^{-1}$ poultry manure revealed a maximum pod length that was statistically significant compared to control and 1000kg ha$^{-1}$ poultry manure.

The positive effect of vermicompost along with recommended inorganic fertilizers might be due to their ability to improve soil physical properties, which provide favorable soil health and conditions and thereby increase the yield contributing parameters and yield.

### Number of seeds pod$^{-1}$

Several seeds influenced by poultry manure rates and (Nrof) were significant. Mung bean produces a higher number of seeds pod$^{-1}$ under various applications of poultry manure fertilizer, the result of this investigation showed that application of 1500 kg ha$^{-1}$ poultry manure revealed a maximum number of seeds pod$^{-1}$ that was statistically significant compared to control and 1000kg ha$^{-1}$ poultry manure.

This finding was partially reported that the application of poultry manure influenced the no of seeds pod$^{-1}$ of cowpeas.
The results also found that organic amendment did not affect the grain pod$^{-1}$ of mung bean (Kumar *et al*., 2002) [34].

**Number of pod plant$^{-1}$**
The number of pod plants$^{-1}$ influenced by poultry manure rates and (Nrof) the highest number of pod plants$^{-1}$ observed at application 1500 kg ha$^{-1}$ poultry manure that statistic call difference from control.
With the increasing rate of vermicompost, an increased number of pods plant$^{-1}$ was also observed by (Ashraf *et al*., 2003) [43].
Similar results were also reported in mung bean (Oad and Buriro, 2005) the application of poultry manure @ 15 t ha$^{-1}$ to soybean recorded a significantly higher number of pods plant$^{-1}$ (Aruna and Narsa Reddy, 1999) [10].
The application of poultry manure @ 2 t ha$^{-1}$ significantly higher the number of pods plant$^{-1}$ of pigeon pea crop over control (Ramesh *et al*., 2006) [40]. The application of poultry manure @5tha$^{-1}$ significantly higher number of pods plant$^{-1}$ (18.6) in groundnut crops over control (Rao and Shaktawat, 2002) [41].

**Thousand seeds weight /gr**
Thousand seeds' weight influenced by poultry manure rates and (Nrof) were significant. Mung beans produce higher Thousand seed weight under various applications of poultry manure fertilizer, the result of this investigation showed that application of 1500 kg ha$^{-1}$ poultry manure revealed a maximum Thousand seed weight that was statistically significant compared to control and 1000 kg ha$^{-1}$ poultry manure.
These results are contradictory and found that the seeds plant was not influenced by organic amendment to that of (Kumar *et al*., 2002) [34]. The application of poultry manure 2 t ha$^{-1}$ recorded significantly higher seed weight (4.14 g) in sunflowers (Chinnamuthu and Venkatakrishnan, 2001) [17].

**Seed yield kg ha$^{-1}$**
Poultry manure rates and (Nrof) had a pronounced influence on the seed yield.1500kgha$^{-1}$ poultry manure fertilizer significantly enhanced the seed yield than control.
A similar result was found from The application of poultry manure @10 t ha$^{-1}$ in malt barley recorded a higher seed yield (44 kg ha$^{-1}$) and The application of poultry manure @15t ha$^{-1}$ to soybean recorded a significant seed yield (1143 kg ha$^{-1}$). (Aruna & Narsa Reddy,1 999) [10].
The plots treated with poultry waste alone had the highest yield of 854 kg ha$^{-1}$ of cowpea crop over control and other treatments.

**Conclusion**
1. From the above results and discussion, it can be concluded that there was not a significant difference between $T_2$&$T_3$ treatments. (700,1000 kg /h) on growth and yield of Mung bean. (in all parameters)
2. Application of (1500 kg/ha) of poultry manure recorded the highest average of the plant height, thousand seeds weight, and seed yield. compared to control and other treatments.
   Application of 1500 ha$^{-1}$ PM showed the best result for growth & yield of Mung bean compared to nutrient-rich organic fertilizer.
3. The results of the study indicated that the effects of poultry manure rates from the Application of 1000kgha$^{-1}$ recorded similar results in growth parameters i.e. Plant height, Number of Branches, and Number of Leaves with the application of 700kg NROF ha$^{-1}$. and showed the tallest plant height (without treatment $T_2$ 700 kg NROF ha$^{-1}$) than others while having significantly higher compared to 0 kg ha$^{-1}$ or control in all growth parameters. number of pod plant$^{-1}$, number of seed pod$^{-1}$, seed yield kg ha$^{-1}$ and thousand seed yield, application of 1500 kg ha$^{-1}$ (PM) was highest and showed similar results with 700kg ha$^{-1}$ NROF (Except seeds yield and thousand seed weight) all treatments.
4. Therefore, it can be concluded that the application of 1500kg h$^{-1}$ PM cost and increase in growth, yield, and yield components of mung bean than 700kgha$^{-1}$ (Nrof) and 1000kg /h OF.

**Recommendation**
1. According to the findings of the study, the application of 1500 kg ha$^{-1}$ PM can be recommended for mung bean, higher productivity, and profitability.
2. For regional compliance such an experiment should be conducted in different Agro- Climatic Conditions in Kabul.
3. More field trials should be conducted to respond with poultry manure fertilizers for a recommendation.
4. Adopting these recommendations can potentially enhance production efficiency and yield per land unit
5. So the sole application of (1500 kg ha$^{-1}$) poultry manure without any recommended dose of inorganic fertilizer) is recommended for a greater yield of Mung bean under the Kabul agroecological conditions and also may be recommended for better mung bean production in the study area and areas with similar agroecology.
6. Since this study was undertaken in a single location and season using only a few poultry manure it is important to repeat the study over different locations using additional levels to come up with a conclusive recommendation.
7. In Afghanistan, especially in Kabul, the plants confront to deficiency of micronutrients such as N and Fe, so I recommend the use of (PM) fertilizer in Afghanistan because it has a good percentage of these micronutrients.

**References**

1. Abbas G, Abbas Z, Aslam M, Malik AU, Ishaque M, Hussain F, *et al*. Effects of organic and inorganic fertilizers on mung bean (*Vigna radiata* L.) yield under arid climate. International Research Journal of Plant Science. 2011;2(4):094-098. ISSN: 2141-5447.
2. Achakzai AKK, Habibullah. Effect of nitrogen fertilizer on the yield and yield attributes of mungbean (*Vigna radiata* (L.)) grown in Quetta. Pakistan Journal of Botany; c2012.
3. Adeoye PA, Adebayo SE, Musa JJ. Growth and Yield Response of Cowpea (*Vigna unguiculata*) to Poultry and Cattle Manure as Amendments on Sandy Loam Soil Plot; c2011.
4. Albiach R, Canet R, Pomares F, Ingelmo F. Organic matter components and aggregate stability after the application of different amendments to a horticultural soil. Bioresource Technology. 2001;76(2):125-129.
5. Amanullah MM, Somasundaram E, Vaiyapuri K, Sathyamoorthi K. Poultry manure to crops - A Review. Agricultural Review. 2007;28:216-222.
6. Anonymous. Agricultural Statistics of Balochistan. Statistical Wing, Directorate General Agriculture (Extension), Balochistan, Quetta, Pakistan; c2008-09b.
7. Anonymous. Economic Survey. Economic Advisors Wing, Ministry of Finance, Government of Pakistan, Islamabad, Pakistan; c2009.

8. Anonymous. Economic Survey India, Ministry of Finance (Economic Division), Government of India, New Delhi; c2009. p. 17-22.
9. Appavu K, Saravanan A, Mathan KK. Effect of organics and irrigation levels of soil physical properties and yield of crops under sorghum - soybean cropping system. Madras Agricultural Journal. 2000;37(1-3):50-53.
10. Aruna P, Narsa Reddy S. Response of soybean (*Glycine max*) to conjunctive use of organic and inorganic sources of nitrogen. Indian Journal of Agricultural Sciences. 1999;69(5):382-383.
11. Baghdadi A, Halim RA, Ghasemzadeh A, Ramlan MF, Sakimin SZ. Impact of organic and inorganic fertilizers on the yield and quality of silage corn intercropped with soybean. Peer Journal. 2018;6:e5280.
12. Baldev B. Cropping patterns: In Pulse Crop (Grain Legumes), Eds B Baldev. S Raman jam and H K Jain. Oxford & IBH Publishing Co Pvt Ltd; c1988. p. 513-557.
13. Bhuiyan MAH, Main MH, Islam MS, Islam MR. Effects of Integrated Use of Fertilizers And Manure On Yield And Nutrient Uptake of T. Aus Rice And Mung Bean in the Wheat-T. Aus Rice/Mungbean-T. Aman Rice Cropping Pattern. Bangladesh Journal of Agricultural Research. 2003;36(4):697-710.
14. Bismillah KM, Asif M, Hussain N, Aziz M. Impact of different levels of phosphorus on growth and yield of Mung bean genotypes. Asian Journal of Plant Science. 2003;2(9):677-679.
15. Channabasavanna AS, Yelamali SG, Biradar DP. Response of rice (*Oryza sativa*) to sources of organic manures and levels of zinc phosphate in deep black soils. Indian Journal of Agronomy. 2001;46(33):458-461.
16. Chiezey UF, Odunze AC. Soybean response to application of poultry manure and phosphorus fertilizer in the Sub-humid Savanna of Nigeria. Journal of Ecology and Natural Environment. 2009;1(2):025-031.
17. Chinnamuthu CR, Venkatakrishnan. Effect of integrating inorganic fertilizer with vermicompost and arbuscular mycorrhizal fungi on the productivity of sunflower. Madras Agricultural Journal. 2001;88(7-9):424-427.
18. Christo IEC, Madukwe DK, Onuh MO. Growth and Yield of Cowpea (*Vigna unguiculata* (L.) Walp) As Influenced by cultivar and organic manure source in the Humid Tropical Environment. International Science Research Journal. 2008;1(1):47-52.
19. Devi KN, Singh TB, Athokpam HS, Singh NB, Shamurailatpam D. Influence of inorganic, biological, and organic manures on nodulation and yield of soybean (*Glycine max* Merril'L.) and soil properties. Australian Journal of Crop Science. 2013;7(9):1407-1415.
20. Enujeke EC. Effects of poultry manure on Growth and yield of improved maize in Asaba area of Delta State Nigeria. Journal of Agricultural and Veterinary Sciences. 2013;4:24-30.
21. Faris DG. The origin and evolution of the cultivated forms of *Vigna sinensis*. Canadian Journal of Genetics and Cytology. 1965;7(3):433-452.
22. Govindan K, Thirumurugan V. Synergistic association of *Rhizobium* with phosphate solubilizing bacteria under different sources of nutrient supply on productivity and soil fertility in soybean (*Glycine max*). Indian Journal of Agronomy. 2005;50(3):214-217.
23. Hassan R. Growth and yield response of mung bean to different seed rates and levels of phosphorus. M.Sc. Thesis, Agron. Deptt., University of Agriculture Faisalabad, Pakistan; c1997.
24. He JZ, Zheng Y, Chen CR, He YQ, Zhang LM. Microbial composition and diversity of upland red soil under long-term fertilization treatments as revealed by culture-dependent and culture-independent approaches. Journal of Soils and Sediments. 2008;8:349-358.
25. Hoorman JJ, Islam R, Sundermeier A. Sustainable crop rotations with cover crops. Ohio State University, Extension, Fact Sheet Agriculture and Natural Resources, SAG-9-09; c2009.
26. Hussain SJ, Masood A, Anjum NA, Khan NA. Sulfur-mediated control of salinity impact on photosynthesis and growth in mungbean cultivars screened for salt tolerance involves glutathione and proline metabolism, and glucose sensitivity. Acta Physiologiae Plantarum. 2019;41:1-13.
27. Hussein HF. Studies on dynamic changes in growth, nutrient contents, and grain yield of maize plants under weed-competitive stress conditions. Mansoura University Journal of Agricultural Sciences. 1997;22(3):643-658.
28. Hussein TO. Effect of poultry manure on the growth of tomato. Proceedings of the 15th annual conference. HORTSON April 8-11, 1997NHORT, Ibadan, Nigeria; c1997. p. 43-45.
29. Karande BI, Patel HR, Patil DD, Yadav SB, Vasani MJ. Influence of irrigation levels and row spacing on yield and yield attributing characters of mung bean varieties (*Vigna radiata* L.) in middle Gujarat Agro-climatic zone. International Journal of Current Microbiology and Applied Sciences. 2019;8(2):464-473.
30. Karmegam N, Daniel T. Effect of bio-digested slurry and vermicompost on the growth and yield of cowpea [*Vigna unguiculata* (L.)]. Environmental Ecology. 2000;18(2):367-370.
31. Kay S. The effects of noise on the autoregressive spectral estimator. IEEE Transactions on Acoustics, Speech, and Signal Processing. 1979;27(5):478-485.
32. Khan A, Malik MA. Determining biological yield potential of different mung bean cultivars. Journal of Biological Sciences. 2001;1:575-576.
33. Khan MQ, Awan SI, Mughal MM. Estimation of genetic parameters in spring wheat genotypes under rain-fed conditions. Indus Journal of Biological Sciences. 2005;2:367-370.
34. Kumar S, Choudhary GR, Chaudhari AC. Effects of nitrogen and biofertilizers on the yield and quality of coriander (*Coriandrum salivum* L.). Annals of Agricultural Research. 2002;23(4):634-637.
35. Lambrides CJ, Godwin ID. Mungbean. In: Chittarajan K, ed. Genome Mapping and Molecular Breeding in Plants. 2006;3:69-90.
36. Lipton M. The place of agricultural research in the development of sub-Saharan Africa. IDS Bulletin. 1985;16(3):14-23.
37. Lipton WJ, Asai WK, Fouse DC. Deterioration and $CO^2$ and ethylene production of stored mung bean sprouts. Journal of the American Society for Horticultural Science. 1981;106:817-820.
38. Liu HK, Zhang HH, Chen Z, Guo YD, Kang YF. Ethylene-induced changes in lignification and cell wall-degrading enzymes in the roots of mung bean (*Vigna radiata*) sprouts. Plant Physiology and Biochemistry. 2013;73:412-419.
39. Kang SM, Khan AL, Waqas M, You YH, Kim JH, Kim JG, *et al*. Plant growth-promoting rhizobacteria reduce adverse

effects of salinity and osmotic stress by regulating phytohormones and antioxidants in Cucumis sativus. Journal of Plant Interactions. 2014 Jan 2;9(1):673-682.

40. Ramesh B, Cao L, Mohan K, Xu P. Can distributed software development be agile? Communications of the ACM. 2006 Oct 1;49(10):41-46.
41. Rao SS, Shaktawat MS. Residual effect of organic manure, phosphorus and gypsum application in preceding groundnut (*Arachis hypogaea*) on soil fertility and productivity of Indian mustard (*Brassica juncea*). Indian Journal of Agronomy. 2002;47(4):487-494.
42. Roy MS. Pakistan's Strategies in Central Asia. Strategic Analysis. 2006 Dec 31;30(4):798-833.
43. Ashraf M, Shahbaz M. Assessment of genotypic variation in salt tolerance of early CIMMYT hexaploid wheat germplasm using photosynthetic capacity and water relations as selection criteria. Photosynthetica. 2003 Jun;41:273-280.