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RESPONSE OF FRENCH BEAN (*Phaseolus vulgaris* L.) TO ORGANIC MANURE REGIMES: EFFECTS ON GROWTH, YIELD COMPONENTS, NUTRIENT CONTENT AND UPTAKE

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ABSTRACT

French bean (*Phaseolus vulgaris* L.) prevalently known as rajma is considered a cornerstone of Indian agriculture and diet. It is acknowledged as one of the most important crop grown for its contribution in plant based protein, and consumed as matured seeds as well as green pods. The hilly region of Nagaland is well suited for this legume where it is grown both as a *kharif* and *rabi* crop. Despite the importance of the crop and the benefits of organic sources of soil nutrients, limited studies have been executed on this topic.Therefore to address this research gap, the present investigation entitled "Response of French Bean (*Phaseolus vulgaris* L.) to Organic Manure Regimes: Effects on Growth, Yield Components, Nutrient Content and Uptake" was initiated during the *rabi* season of 2024 at the research farm of ICAR KVK Peren, Nagaland. The treatment considered for the study were T_1: Control, T_2: FYM @ 10 t ha^{-1} (T_2), T_3: Poultry litter @ 5 t ha^{-1}, T_4: Forest litter @ 5 t ha^{-1}, T_5: Pig manure @ 5 t ha^{-1}, T_6: Goat manure @ 5 t ha^{-1}, T_7: Vermicompost @ 5 t ha^{-1}, and T_8: Enriched compost @ 2.5 t ha^{-1}. The treatments were replicated three times and the field were laid out in a Randomized Block Design (RBD). Gomez and Gomez (2004) technique was followed in the analysis of data. Parameters recorded in this study were plant height, number of primary branches, dry matter accumulation, number of pods, seeds per pod, seed yield, test weight, stover yield, nutrient content and uptake in seeds and crude protein content. Results confirmed that plant height and number of primary branches per plant was peak under poultry litter with 48.66 cm and 5.11, respectively. Dry matter accumulation was significantly enhanced by poultry litter, recording the highest values of 8.96 g plant^{-1} at 50 DAS and 12.89 g plant^{-1} at 75 DAS. Poultry litter also recorded the highest number of pods per plant (15.40) and seed yield was higher under poultry litter (1500 kg ha^{-1}). Similarly, test weight (33.74 g) and stover yield (1350 kg ha^{-1}) were highest under poultry litter treatment. Nutrient uptake was also enhanced considerably, with poultry litter recording the highest nitrogen uptake (40.31 kg ha^{-1}), while phosphorus uptake was highest under pig manure (16.23 kg ha^{-1}) and potassium uptake under vermicompost (46.24 kg ha^{-1}). Crude protein content was significantly improved under poultry litter (20.62%). Poultry litter recorded the highest nitrogen (3.30%), phosphorus (0.12%) and potassium (1.39%) content in seeds.
***Keywords* :** Legume, Nutrients, Organic manures, Yield.

Introduction

French bean (*Phaseolus vulgaris* L.) is a prominent leguminous vegetable crop widely cultivated for its high nutritional value, protein content and vital contribution to food and nutritional security. Because of its short lifespan, capacity to adapt to a variety of agroclimatic conditions and contribution to improving farm income and dietary quality, it is produced extensively (Sinkovic *et al*., 2024; Menga *et al*., 2023). As a legume, French bean naturally fixes atmospheric nitrogen through symbiotic relationships, which lessens reliance on outside nitrogen inputs and promotes sustainable agricultural systems (Gowthamchand *et al.,* 2019; Banla *et al.,* 2025). Despite its agronomic significance, French bean productivity is frequently constrained by deteriorating soil fertility, unbalanced nutrient management, and an over reliance on chemical fertilizers, which have resulted in nutrient depletion and a decline in soil health. Adopting more sustainable nutrient management techniques is required since the ongoing and untailored application of chemical fertilizers has pessimistically impacted the physical, chemical and biological characteristics of soil in addition to decreasing soil productivity (Datt *et al.,* 2013).

In this regard, the application of organic manures such as vermicompost, farmyard manure and other bio-organic inputs has grown in significance as sustainable and environmentally safe substitutes for preserving soil fertility and raising crop yields. Organic manures plays a key process in enriching soil fertility and plant nutrition by making organically bound nutrients into available forms to plants through microbial decomposition (Navi *et al*., 2025). The induction of organic manures in natural farming specifically 50% of the recommended dose significantly improved soil attributes and escalated soybean yield in an investigation in the Northern Transition Zone of Karnataka, India (Swathi *et al*., 2026). Similar trend was also reported by Banoth *et al*. (2025) under *rabi* sweet corn production in the College of Agriculture, Rjendranagar, PJTSAU, Hyderabad, Telangana. Research has shown that incorporating organic manures and bio-organic inputs to French bean agriculture greatly enhances growth metrics, yield attributes, nutrient uptake and economic returns (Gowthamchand *et al.,* 2019; Sharma & Thakur, 2022). Organic manures play a crucial role in enhancing soil organic matter content, which is a key determinant of soil quality and productivity, as it improves soil structure, water holding capacity, nutrient availability and microbial activity. Plant growth and development are supported by soil organic matter, which serves as a storehouse of vital nutrients and has a major impact on soil physical, chemical and biological processes. Additionally, organic amendments increase soil aggregation, cation exchange capacity, and nutrient cycling all of which promote soil fertility and crop performance (Gurmu, 2019). Furthermore, soil biological activity and enzyme functions which are critical for nutrient mineralization and plant availability are improved by organic nutrient management techniques.

Induction of organic manures significantly enhanced the soil properties and moisture status of the studied site which may ultimately augment the production of French bean in Nagaland (Balmiki *et al*., 2026). The importance of organic farming methods in enhancing soil health, preserving ecological balance, and guaranteeing long term agricultural sustainability is becoming more widely acknowledged. These systems rely on natural inputs including composts, manures, crop wastes, and biological processes. Since soil functions as a living system that promotes plant development and ecosystem functioning, maintaining and improving soil health is thought to be essential to maintaining agricultural productivity (Tully and McAskill, 2019). However, the efficacy of various organic manures may change according on their composition, patterns of nutrient release, and application techniques, resulting in differences in crop response under various circumstances (Sharma and Thakur, 2022). Therefore, a systematic evaluation of the impact of organic manures on growth and yield parameters of French bean is essential to develop efficient and sustainable nutrient management strategies. Nagaland with its undulating topography and erratic rainfall pattern requires proper soil management strategies which includes proper nutrient management along with appropriate tillage implementation, so that minimal soil losses and proper plant nutrition can be delivered (Ngullie *et al*., 2025). In this context, the present study was undertaken to evaluate the impact of organic manures on the growth and yield of French bean (*Phaseolus vulgaris* L.) with the objective of identifying suitable organic nutrient sources for enhancing crop performance while maintaining soil health.

Materials and Method

The experiment was initiated during the *rabi* season of the year 2024 at the research field of KVK Peren: ICAR NEH Region, which is located at 25° 39'48" North latitude and 93° 38'21" East longitude with an altitude of 295.80 m above mean sea level. Located in the Mid Tropical Hill Zone, the research farm receives an average annual rainfall of 1600 mm, with a high relative humidity of 75-85%. The mean temperature ranges from 23-31 °C during summer and 10-15 °C during winter. Prior to sowing of seeds, organic manures as per recommendation were applied uniformly and thoroughly incorporated into the soil. The experiment was laid out following Randomized Block Design (RBD) with 3 replications to control field variability across plots. The variety used in the experiment was *Arka suvidha* (Bush type variety). The number of treatments used in the experiment was 8, *i.e.* T_1: Control, T_2: FYM @ 10 t ha^{-1} (T_2), T_3: Poultry litter @ 5 t ha^{-1}, T_4: Forest litter @ 5 t ha^{-1}, T_5: Pig manure

@ 5 t ha^{-1}, T_6: Goat manure @ 5 t ha^{-1}, T_7: Vermicompost @ 5 t ha^{-1}, and T_8: Enriched compost @ 2.5 t ha^{-1}. To assess growth parameters of the crop at various stages, five randomly selected plants were marked and assessed accordingly. Gomez and Gomez (2004) technique was followed in the data analysis, data were analysed based on a one factor (RBD) and significance was determined at $p = 0.05$. For mean comparison, the critical difference (CD) and standard error of the mean (SEm ±) were determined accordingly.

Results and Discussion

The application of different organic manures significantly influenced the growth, yield, quality and nutrient uptake of French bean, marking the importance of organic nutrient sources in improving crop performance under rainfed conditions.

Plant height and number of primary branches

Plant height was significantly influenced by different organic manure treatments, with the highest plant height measured under poultry litter (T_3) (48.66 cm), followed by vermicompost (43.38 cm) and FYM (40.22 cm), while the lowest was detected in control (29.83 cm) as portrayed in Table 1. The increase in plant height under poultry litter may be attributed to its higher nutrient content and rapid mineralisation, which enhanced nutrient availability, cell division and elongation. Vermicompost and FYM also improved plant height due to their positive influence on soil structure, microbial activity and sustained nutrient release. The present findings are in close agreement with the reports of Kamble *et al*. (2016) and Singh *et al*. (2011), who observed a significant augmentation in plant height were observed following integration of poultry litter and vermicompost.

The number of primary branches per plant followed a similar trend, with the maximum number acquired in poultry litter integration (5.11), followed by vermicompost (4.88) and FYM (4.55), whereas miniscule level was achieved in plots were no treatments were inducted (4.22). Enhanced branching under organic treatments may be due to improved vegetative growth, better nutrient availability, and hormonal effects associated with organic amendments, particularly vermicompost. It corroborates with the findings of Prabhakar *et al*. (2011), who reported improved branching and plant architecture in legumes due to organic nutrient sources. Similar observations were also made by Singh *et al*. (2023), who attributed enhanced branching to improved nutrient availability and moisture retention under organic manure application.

Dry matter accumulation

Dry matter accumulation (DMA) was significantly influenced by organic manures at both 50 and 75 DAS. At 50 DAS, the premier DMA was achieved in poultry litter (8.96 g), followed by vermicompost (8.79 g) and goat manure (8.16 g), whereas the lowest was observed in control (3.22 g). A similar trend was obtained at 75 DAS, with poultry litter recording the maximum DMA (12.89 g), followed by vermicompost (11.29 g) and FYM (10.66 g), while control noted the least (5.82 g) as outlined in Table 2. The amplified biomass production under poultry litter and vermicompost can be attributed to their rich nutrient content, improved nutrient mineralisation, and enhanced microbial activity, which collectively improve photosynthesis and vegetative growth. In contrast, lower dry matter accumulation in control plots may be due to poor nutrient availability and reduced biological activity. The higher dry matter accumulation recorded under poultry litter and vermicompost treatments is in conformity with the findings of Singh *et al*. (2011) and Das *et al*. (2018), who reported significant enhancement in biomass production due to improved nutrient release, microbial activity and photosynthetic efficiency under organic manure application.

Number of pods and seeds per pod

The number of pods per plant and seeds per pod were significantly influenced by organic manure application. The highest number of pods per plant was measured in poultry litter (15.40), followed by vermicompost (13.27) and FYM (12.67), while the lowest was marked in control (9.67). The data associated to number of pods and seeds per pod are presented in Table 3. The increase in pod number may be attributed to improved nutrient availability, particularly nitrogen and phosphorus, which are essential for flowering, pod formation and retention. Similarly, the number of seeds per pod was peak under poultry litter (4.60) followed by vermicompost (4.47) and goat manure (4.40), whereas the minimal was registered in forest litter (4.17). Improved seed setting under organic treatments may be due to better nutrient supply and enhanced physiological activity during reproductive stages. The results are in agreement with the findings of Argaw and Mnalku (2017) who summarized that a significant increase in the number of pods per plant in legumes following the application of poultry litter and vermicompost owing to improved nutrient availability and reproductive health. Baghlani *et al*. (2024) and Menaria *et al*. (2024) also reported higher seed numbers per pod in pulse crops under poultry manure and vermicompost treatments. The improvement was attributed to better nutrient availability during reproductive stages, leading to enhanced flower fertilization and seed setting.

Seed yield, test weight and stover yield

Seed yield, test weight and stover yield were significantly influenced by organic manure. The highest seed yield was documented in poultry litter (1500 kg ha^{-1}), followed by vermicompost (1450 kg ha^{-1}) and FYM (1340 kg ha^{-1}), while the lowest yield was highlighted under organic manure excluded plot (1115 kg ha^{-1}). The superior yield under poultry litter may be due to its higher nutrient content and faster mineralisation, resulting in improved nutrient uptake and better growth and yield attributes. The data related to seed yield, test weight and stover yield is presented in Table 4. The elevated seed yield observed under poultry litter and vermicompost application is in close conformity with the findings of Gopinath and Mina (2011) and Al-Tawarah *et al*. (2024), who reported substantial boost in legume yield due to improved nutrient availability, soil fertility and biological activity resulting from organic manure application. The induction of organic manure such as Farm Yard Manure @ 5 t ha^{-1} significantly rejuvenated pea production in the hilly NEH Region of India, Nagaland (Haiguipeung *et al*., 2025).

Test weight also followed a similar trajectory whereby the highest value was recorded under poultry litter integrated plot (33.74 g), followed by vermicompost (32.42 g) and FYM (30.21 g), whereas the lowest was recorded in control (25.48 g). Increased test weight under organic manure treatments indicates better grain filling due to improved nutrient availability during reproductive stages. The increase in test weight under poultry litter and vermicompost treatments is in agreement with the findings of Sharma and Thakur (2022) who reported improved seed weight in leguminous crops following organic nutrient management. The enhanced grain filling may be attributed to better nutrient availability during the reproductive phase.

Stover yield was maximum in poultry litter amended plot (1350 kg ha^{-1}), trailed by vermicompost (1303 kg ha^{-1}) and FYM (1250 kg ha^{-1}), while control measured the lowest (1180 kg ha^{-1}). The increased stover yield may be attributed to enhanced vegetative growth and biomass accumulation under organic manure application. The results of the present study are in accordance with the findings of Zahida *et al*. (2016), who reported increased stover yield in leguminous crops with the application of organic manures. The higher stover yield may be attributed to improved vegetative growth, biomass accumulation and enhanced nutrient availability under organic nutrient management.

Nutrient content in seed

The nutrient content in seeds was significantly influenced by organic manures. The highest nitrogen content was achieved in poultry litter (3.30%), followed by vermicompost (3.27%) and FYM (3.23%), while the lowest was detected in untreated plot (2.57%). Similarly, phosphorus content was top in poultry litter (0.12%), while miniscule change was noted under control (0.09%). Potassium content was also highest in poultry litter (1.39%), followed by enriched compost (1.37%) and vermicompost (1.36%), whereas control registered the lowest (1.08%). The data pertaining to nutrient content (N, P, K) in seeds is presented in Table 5. The increase in nutrient content may be attributed to enhanced nutrient availability, improved uptake, and better translocation of nutrients to seeds under organic manure treatments. The higher nitrogen content recorded in seeds under poultry litter and vermicompost treatments is in agreement with the findings of Eko *et al*. (2014), who reported enhanced seed nitrogen concentration in legumes due to improved soil nitrogen availability and rhizosphere activity following organic manure application. Koutroubas *et al*. (2016) reported that phosphorus concentration in grains following the application of organic manures. Enhanced microbial activity and phosphorus solubilisation under organic amendments were considered responsible for the increased phosphorus accumulation in seeds. Amusan *et al*. (2011), also reported potassium accumulation in legume seeds under poultry manure and compost application. The increased potassium content may be attributed to improved potassium availability and uptake efficiency resulting from enhanced soil organic matter and cation exchange capacity.

Nutrient uptake in plant

Nutrient uptake by French bean was significantly influenced by organic manures. The highest nitrogen uptake was achieved in poultry litter treated plot (40.31 kg ha^{-1}), followed by vermicompost (38.95 kg ha^{-1}) and FYM (37.66 kg ha^{-1}), whereas control (13.91 kg ha^{-1}) marked the least. Phosphorus uptake was highest in pig manure (16.23 kg ha^{-1}), followed by vermicompost (15.93 kg ha^{-1}) and poultry litter (14.12 kg ha^{-1}), while the lowest was recorded in control (5.49 kg ha^{-1}). Potassium uptake was peak in vermicompost amended plot (46.24 kg ha^{-1}), followed by poultry litter (42.96 kg ha^{-1}) and pig manure (42.19 kg ha^{-1}), whereas the lowest was recorded in forest litter (16.69 kg ha^{-1}). The increased nutrient uptake under organic manures may be attributed to improved soil fertility, enhanced microbial activity, and better root development which collectively enhance nutrient absorption and utilisation. The data pertaining to nutrient uptake (N, P, K) is presented in Table 6. The higher nitrogen uptake observed under poultry litter and vermicompost treatments is in agreement with the findings of Sharma *et al*. (2018), who reported significantly increased nitrogen uptake in legumes due to improved nutrient cycling, mineralization and retention in the rhizosphere under organic nutrient management. The findings of the present study are supported by Fageria *et al*. (2016), who reported enhanced phosphorus uptake in legumes following the application of organic manures. Increased phosphorus availability, reduced fixation and improved microbial solubilisation of phosphorus were identified as the major factors contributing to greater phosphorus uptake.

Crude protein content

Crude protein content was significantly influenced by organic manure application. The highest crude protein content was recorded in poultry litter (20.62%), followed by vermicompost (20.41%) and FYM (20.21%). The lowest crude protein was registered under untreated plot i.e. control (16.08%) as portrayed in Table 7. The amplification in protein content under organic treatments may be attributed to enhance nitrogen availability and uptake, as protein synthesis is directly dependent on nitrogen content. Poultry litter, being rich in readily available nitrogen, significantly improved protein synthesis in French bean seeds. The present findings are in close agreement with the reports of Sharma *et al*. (2018) and Paul *et al*. (2018), who observed increased crude protein content in legumes following the application of poultry litter and vermicompost. The enhancement in protein content was mainly attributed to improved nitrogen availability and uptake, which promoted amino acid synthesis and protein formation in seeds.

Conclusion

Based on the findings of the present investigation, it was observed that the application of organic manures significantly improved the growth, yield, quality and nutrient uptake of French bean. Among the various organic manures treatments, poultry litter (T_3) verified to be the most effective in enhancing crop performance. Plant height was peak under poultry litter (48.66 cm), representing an amplification of approximately 63.12% over the untreated plot (29.83 cm), while the maximum number of primary branches per plant (5.11) was also acquired under poultry litter in contrast to control (4.22). Dry matter accumulation was significantly enhanced by poultry litter, recording the highest values of 8.96 g plant^{-1} at 50 DAS and 12.89 g plant^{-1} at 75 DAS, whereas the lowest dry matter accumulation was observed under the control treatment. Yield attributes were markedly improved with organic manure application. Poultry litter recorded the highest number of pods per plant (15.40), which was approximately 59.26% higher than the control (9.67), and also produced the highest number of seeds per pod (4.60). Seed yield was maximum under poultry litter (1500 kg ha^{-1}), showing an increase of about 34.53% over the control (1115 kg ha^{-1}). Similarly, test weight (33.74 g) and stover yield (1350 kg ha^{-1}) were highest under poultry litter treatment, indicating superior grain development and biomass production. The nutrient content of seeds was significantly improved by organic manure application. Poultry litter recorded the highest nitrogen (3.30%), phosphorus (0.12%) and potassium (1.39%) content in seeds compared to the control values of 2.57%, 0.09% and 1.08%, respectively. Nutrient uptake was also enhanced considerably, with poultry litter recording the highest nitrogen uptake (40.31 kg ha^{-1}), while phosphorus uptake was highest under pig manure (16.23 kg ha^{-1}) and potassium uptake was highest under vermicompost (46.24 kg ha^{-1}). Crude protein content was significantly improved under poultry litter (20.62%), followed by vermicompost (20.41%) as compared to the lowest value observed in the control (16.08%). Overall, the results demonstrate that poultry litter was the most effective organic manure for improving growth, yield attributes, seed yield, nutrient content, nutrient uptake and crude protein content of French bean under the agro-climatic conditions of Peren, Nagaland. Therefore, poultry litter can be recommended as a suitable organic nutrient source for enhancing French bean productivity while promoting sustainable crop production.

Table 1 : Effect of organic manures on plant height and number of primary branches

Treatment	Plant height (cm)	Primary branches
T_1 – Control	29.83	4.22
T_2 – FYM @ 10 t ha^{-1}	40.22	4.55
T_3 – Poultry litter @ 5 t ha^{-1}	48.66	5.11
T_4 – Forest litter @ 5 t ha^{-1}	31.66	4.26
T_5 – Pig manure @ 5 t ha^{-1}	35.66	4.44
T_6 – Goat manure @ 5 t ha^{-1}	38.00	4.44
T_7 – Vermicompost @ 5 t ha^{-1}	43.38	4.88
T_8 – Enriched compost @ 2.5 t ha^{-1}	33.83	4.41
SEm±	**1.78**	**0.33**
CD (p = 0.05)	**5.40**	**NS**

Table 2 : Effect of organic manures on dry matter accumulation (g per plant) in French bean at 50 DAS & 75 DAS

Treatment	Dry matter accumulation (50 DAS)	Dry matter accumulation (75 DAS)
T_1 – Control	3.22	5.82
T_2 – FYM @ 10 t ha^{-1}	7.05	10.66
T_3 – Poultry litter @ 5 t ha^{-1}	8.96	12.89
T_4 – Forest litter @ 5 t ha^{-1}	3.53	6.78
T_5 – Pig manure @ 5 t ha^{-1}	6.03	8.52
T_6 – Goat manure @ 5 t ha^{-1}	8.16	10.18
T_7 – Vermicompost @ 5 t ha^{-1}	8.79	11.29
T_8–Enriched compost @ 2.5 t ha^{-1}	4.03	6.82
SEm±	**1.15**	**0.59**
CD (p = 0.05)	**3.50**	**1.78**

Table 3 : Effect of organic manures on number of pods per plant & number of seeds per pod in French bean

Treatment	Number of pods per plant	Number of seeds per pod
T_1 – Control	9.67	4.27
T_2 – FYM @ 10 t ha^{-1}	12.67	4.27
T_3 – Poultry litter @ 5 t ha^{-1}	15.40	4.60
T_4 – Forest litter @ 5 t ha^{-1}	10.80	4.17
T_5 – Pig manure @ 5 t ha^{-1}	10.33	4.27
T_6 – Goat manure @ 5 t ha^{-1}	11.80	4.40
T_7 – Vermicompost @ 5 t ha^{-1}	13.27	4.47
T_8 – Enriched compost @ 2.5 t ha^{-1}	11.20	4.33
SEm±	**0.94**	**0.25**
CD (p = 0.05)	**2.86**	**NS**

Table 4 : Effect of organic manures on yield components of French bean

Treatment	Test weight (g)	Seed yield (kg h^{-1})	Stover yield (kg h^{-1})
T_1 – Control	25.48	1115	1180
T_2 – FYM @ 10 t ha^{-1}	30.21	1340	1250
T_3 – Poultry litter @ 5 t ha^{-1}	33.74	1500	1350
T_4 – Forest litter @ 5 t ha^{-1}	27.84	1118	1190
T_5 – Pig manure @ 5 t ha^{-1}	28.69	1225	1207
T_6 – Goat manure @ 5 t ha^{-1}	29.81	1280	1220
T_7 – Vermicompost @ 5 t ha^{-1}	32.42	1450	1303
T_8 – Enriched compost @ 2.5 t ha^{-1}	28.16	1210	1211
Sem±	**0.56**	**6.68**	**3.95**
CD (p = 0.05)	**1.69**	**20.27**	**11.99**

Table 5 : Effect of organic manures on NPK content in seeds of French bean

Treatment	N (%)	P (%)	K (%)
T_1 – Control	2.57	0.09	1.08
T_2 – FYM @ 10 t ha^{-1}	3.23	0.11	1.33
T_3 – Poultry litter @ 5 t ha^{-1}	3.30	0.12	1.39
T_4 – Forest litter @ 5 t ha^{-1}	2.67	0.09	1.12
T_5 – Pig manure @ 5 t ha^{-1}	3.20	0.11	1.34
T_6 – Goat manure @ 5 t ha^{-1}	3.20	0.11	1.34
T_7 – Vermicompost @ 5 t ha^{-1}	3.27	0.11	1.36
T_8 – Enriched compost @ 2.5 t ha^{-1}	3.17	0.12	1.37
SEm±	**0.07**	**0.00**	**0.03**
CD (p = 0.05)	**0.21**	**0.01**	**0.09**

Table 6 : Effect of organic manures on NPK uptake in plant of French bean

Treatment	N uptake (kg h^{-1})	P uptake (kg h^{-1})	K uptake (kg h^{-1})
T_1 – Control	13.91	5.49	18.30
T_2 – FYM @ 10 t ha^{-1}	37.66	7.91	22.96
T_3 – Poultry litter @ 5 t ha^{-1}	40.31	14.12	42.96
T_4 – Forest litter @ 5 t ha^{-1}	14.64	5.57	16.69
T_5 – Pig manure @ 5 t ha^{-1}	19.55	16.23	42.19
T_6 – Goat manure @ 5 t ha^{-1}	29.72	6.59	19.13
T_7 – Vermicompost @ 5 t ha^{-1}	38.95	15.93	46.24
T_8 – Enriched compost @ 2.5 t ha^{-1}	16.29	11.75	34.10
SEm±	**0.90**	**0.35**	**1.06**
CD (p = 0.05)	**2.72**	**1.07**	**3.20**

Table 7 : Effect of organic manures on crude protein

Treatment	Crude protein (%)
T_1 – Control	16.08
T_2 – FYM @ 10 t ha^{-1}	20.21
T_3 – Poultry litter @ 5 t ha^{-1}	20.62
T_4 – Forest litter @ 5 t ha^{-1}	16.66
T_5 – Pig manure @ 5 t ha^{-1}	20.00
T_6 – Goat manure @ 5 t ha^{-1}	20.00
T_7 – Vermicompost @ 5 t ha^{-1}	20.41
T_8 – Enriched compost @ 2.5 t ha^{-1}	19.79
SEm±	**0.44**
CD (p = 0.05)	**1.34**

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