

Original Research Article

Influence of Vermicompost and Foliar Applications on Growth, Physiological and Yield Parameters of Irrigated Blackgram (*Vigna mungo*)

Abstract

Field experiments were conducted at the North farm in Karunya Institute of Technology and Sciences, Division of Agronomy, Coimbatore, during the Rabi season of 2022. The experimental site is situated in the western agro-climatic zone of Tamil Nadu, at a latitude of 10°56'N and longitude of 76°44'E, with an elevation of 474 meters above mean sea level. The soil composition of the experimental field was identified as clay loam, moderately drained, and exhibited low availability of nitrogen (202 kg/ha), high availability of phosphorus (12.3 kg/ha), medium availability of potassium (415 kg/ha), and organic carbon content of 0.51%. The experiment followed a randomized block design (RBD) with 10 treatment groups, each replicated three times viz., T₁ - Control, T₂ - Vermicompost 100% (on N Equivalent basis) + Cowdung slurry, T₃ - Vermicompost 100% (on N Equivalent basis) + TNAU Biomineralizer, T₄ - Vermicompost 100% (on N Equivalent basis) + (Effective microorganism), T₅ - Vermicompost 100% (on N Equivalent basis) + *Pleurotus* sp + Urea, T₆ - Vermicompost (50%) + RDF (50%) + Cowdung slurry, T₇ - Vermicompost (50%) + RDF (50%) + TNAU Biomineralizer, T₈ - Vermicompost (50%) + RDF (50%) + EM (Effective Microorganism), T₉ - Vermicompost (50%) + RDF (50%) + *Pleurotus* sp, T₁₀ - RDF alone. The objective of the study was to investigate the impact of vermicompost and other foliar applications on the growth, physiological characteristics, and yield parameters of an irrigated Black gram (VBN8 variety). From this Experiment it was Concluded that the RDF (T₁₀) Shows a highest range in growth, physiological and yield parameters of irrigated Blackgram.

Keywords: Blackgram, Foliar spray, organic manures, pulses, RDF, Vermicompost, Yield.

Comment [RL1]: Add 3-4 more sentences about the result of the experiment before the conclusion.

Introduction

For a significant portion of the global population, legumes, commonly referred to as pulses, hold immense dietary importance. While not all legumes fall under the category of pulses, the terms "legumes" and "pulses" are used interchangeably. The leguminosaeae family comprises legume species that serve as essential sources of nourishment for both humans and domestic animals, often in the form of dried grains. Pulse grains are rich in phytochemicals, vitamins, minerals, dietary fiber, protein, and carbohydrates. Pulses are a staple in the diets of many individuals worldwide, providing a vital source of

protein alongside cereal consumption. The high lysine and folate levels in pulses make them an excellent choice for combining with cereals to create composite flours. In terms of total carbohydrates, fat, niacin, riboflavin, thiamine, and vitamin B6, pulses and cereal grains exhibit comparable levels. However, pulses surpass cereal grains in terms of protein, folate, iron, magnesium, potassium, and zinc content. Pulses, which are leguminous crops cultivated on an annual basis, have a dual purpose of being utilized as both food and feed. Within their pods, pulses produce variable-sized, shaped, and colored grains or seeds, ranging from 1 to 12. These crops hold significant worth due to their substantial protein content and their ability to contribute to a low glycemic index. (Singh, 2017). They form an integral part of the staple diets in many developing countries in South Asia and Africa, where they are consumed by a significant portion of the population. (Kumar *et al.*, 2022)

In contemporary agriculture, extensive reliance on synthetic fertilizers and pesticides is common practice among farmers to boost the yield of various crops. However, the use of these chemical substances poses a significant risk to both soil fertility and human well-being. Consequently, there has been a notable upsurge in interest regarding the adoption of organic manures as an alternative approach. Organic farming has gained popularity as an environmentally conscious method that aims to achieve economically sustainable crop production. This agricultural practice involves the utilization of organic soil amendments as nutrient sources. One valuable organic manure is farmyard manure, which contains approximately 0.5% nitrogen, 0.2% phosphorus, and 0.5% potassium. When used in conjunction with chemical fertilizers, it helps maintain soil health and enhance crop productivity. Vermicompost, created through the decomposition process facilitated by various species of worms, such as red wigglers, white worms, and other earthworms, is another beneficial organic amendment. Vermicompost is a mixture of decomposing vegetables or food waste, bedding materials, and vermicast. With approximately 0.6% nitrogen, 1.34% phosphorus, and 0.4% potassium, vermicompost provides valuable nutrients to support plant growth. (Anasuyamma*et al.*, 2022)

Foliar fertilizers have gained significant attention due to the numerous advantages associated with their application method. By applying nutrients directly to the plant's foliage, foliar fertilizers offer a swift and efficient response to the plant's nutritional needs, require smaller product quantities, and bypass soil conditions. The supplementation of crop growth through foliar fertilization is widely recognized for improving the mineral status of plants, leading to increased crop yields.

Blackgram, scientifically known as *Vigna mungo* and commonly referred to as Urad in India, has its origins in India and is primarily cultivated in various Asian countries such as Pakistan, Myanmar, and select regions of Southern Asia. India holds the distinction of being the largest global producer and consumer of blackgram. According to the 1st Advance Estimates of Production of Food grains for 2022-23, as of February 3, 2023, the estimated production of black gram in India during the Rabi season reached 1.84 million tonnes. However, there was a 5.0% decrease in black gram cultivation area, which stood at 7.77 lakh hectares (19.21 lakh acres), compared to 8.18 lakh hectares (20.23 lakh acres) in the previous year. |

2. Materials and Methods

Field experiments were conducted at the North farm in Karunya Institute of Technology and Sciences, Division of Agronomy, Coimbatore, during the Rabi season of 2022. The objective of the study was to investigate the impact of vermicompost and other foliar applications on the growth, physiological characteristics, and yield parameters of an irrigated Black gram (VBN8 variety). The experimental site is situated in the western agro-climatic zone of Tamil Nadu, at a latitude of 10°56'N and longitude of 76°44'E, with an elevation of 474 meters above mean sea level. The soil composition of the experimental field was identified as clay loam, moderately drained, and exhibited low availability of nitrogen (202 kg/ha), high availability of phosphorus (12.3 kg/ha), medium availability of potassium (415 kg/ha), and organic carbon content of 0.51%. The experiment followed a randomized block design (RBD) with 10 treatment groups, each replicated three times.

T₁- Control, T₂-Vermicompost 100%(on N Equivalent basis)+ Cowdung slurry, T₃-Vermicompost 100%(on N Equivalent basis)+TNAU Biomineralizer, T₄ -Vermicompost 100% (on N Equivalent basis)+ (Effective microorganism) ,T₅ . Vermicompost 100% (on N Equivalent basis)+ *Pleurotus sp*+ Urea, T₆.Vermicompost (50%) + RDF (50%) + Cowdung slurry, T₇. Vermicompost (50%) + RDF (50%) + TNAU Biomineralizer, T₈ .Vermicompost (50%) + RDF (50%) + EM (Effective Microorganism) ,T₉ .Vermicompost (50%) + RDF (50%) + *Pleurotus sp*, T₁₀ - RDF alone

The data were subjected to statistical analysis of the variance method (Gomez and Gomez, 1984).

3. Results and Discussion

3.1. Growth Parameters

Throughout different stages of crop growth, namely 20DAS, 40DAS, 60DAS, and Harvest, the effects of vermicompost and other foliar applications on the plant height of irrigated black gram were recorded. The highest plant height measurements were consistently observed in the RDF (T₁₀) alone, measuring 22.52cm, 35.76cm, 38.93cm, and 39.66cm across all growth stages. On the other hand, the lowest plant height measurements were consistently recorded in the Control (T₁), measuring 15.20cm, 25.47cm, 26.69cm, and 27.39cm in the respective growth stages. The significant influence of the crop on plant height was observed in this season. The highest plant height recorded in RDF (T₁₀) alone was on par with Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer(T₃), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅) and Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂). The minimum value was recorded in Control (T₁) was statistically on par with Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆) , Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer(T₇), Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉) at 20DAS

At 40DAS, 60DAS the maximum plant height observed in RDF alone(T₁₀) was on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry(T₂), Vermicompost 50% + RDF 50% +

Comment [RL3]: Take this out of the Materials and Methods and consider this under a sub-section on Rationale and Objectives of the Study.

Comment [RL4]: Show a locational map of the study site.

Comment [RL5]: Show a graphical representation of the experimental design for easy appreciation of the experiment.

Comment [RL6]: Make a few more discussions on this matter.

2% TNAU Biomineralizer(T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), (T₅)- Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea, Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer(T₇). The minimum value was Control (T₁) and was statistically on par with Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer(T₇), (T₈)- Vermicompost 50% + RDF 50% + 2%Effective Microorganism(T₈), Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉)

At harvest the maximum plant height observed in RDF (T₁₀) was statistically on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer (T₇), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea(T₅), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer(T₇),Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈),whereas Control (T₁) was recorded lowest and was on par with Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer(T₇), Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉). As mentioned in Fig 1

The data collected demonstrates the impact of vermicompost and other foliar sprays on the dry matter production of black gram. The observations were recorded at different growth stages, including 20DAS, 40DAS, 60DAS, and Harvest. There was a significant increase in dry matter production (DMP) from 20DAS to 40DAS and a slight increase from 60DAS to the harvest stage. The maximum range of DMP across all observations was observed in only RDF was applied (320 kg ha⁻¹, 910 kg ha⁻¹, 1345 kg ha⁻¹, 3390 kg ha⁻¹). Conversely, the minimum range of DMP was observed in Control (T₁) (170 kg ha⁻¹, 402 kg ha⁻¹, 706 kg ha⁻¹, 2100 kg ha⁻¹).

At 20 and 40 DAS the maximum DMP range was recorded in RDF (T₁₀) alone and it was significantly on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂), Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅). The lowest range of DMP recorded at 20DAS was at Control (T₁) and it was statistically on par with Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆), Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉). The highest DMP range collected in RDF (T₁₀) alone was statistically on par withVermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅) at 60DAS as mentioned in Fig 2

At 40 DAS and 60DAS, the lowest range of DMP was observed in Control (T₁) it was significantly on par with Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea(T₉). The highest range of DMP was observed at RDF (T₁₀) alone and was statistically on par with all other treatments except Control (T₁) which shows inferior performance in terms of DMP. As mentioned in table 1

The increased plant height observed in these treatments was attributed to the utilization of chemical fertilizers, which promotes improved vegetative growth. This, in turn, contributes to enhanced

plant height and total dry matter production Dwivedi (2022) Similar findings were reported by (Amruta et al., 2016)

3.2. Physiological parameters

3.2.1. Leaf area index

The data collected for this parameter from this experiment the highest range was observed in RDF (T₁₀) alone (0.42) and it was significantly on par with Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost In 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), and a lesser range of (0.10) in Control (T₁) was statistically on par with, T₉- Vermicompost 50% + RDF 50% + 2% *Pleurotus. sp* +2% Urea at 20DAS. as mentioned in Table 2

At 40 DAS the highest range of observation was reported in T₁₀- RDF alone (3.84) and it was on par with Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅) and minimum range of observation were acquired in Control (T₁) (1.47) and it was inferior to all other treatments. The data recorded in 60DAS shows that the highest range was observed at RDF (T₁₀) alone (5.53) and it was on par with the following treatments Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂) Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄) Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer (T₇), Vermicompost 50% + RDF 50% + 2% Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆), Vermicompost 50% + RDF 50% + 2% Effective Microorganism (T₈), and the least value was observed in Control (T₁) (3.56) it was significantly on par with, Vermicompost 50% + RDF 50% + 2% *Pleurotus. sp* +2% Urea. (T₉) as mentioned in Fig 3

3.2.2 Crop growth rate

The data collected in this parameter during 20-40 DAS of this experiment shows the highest range of (2.95g m⁻²day⁻¹) in RDF (T₁₀) alone and it was on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂) Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅), and the lesser range was observed Control (T₁) (2.18g m⁻²day⁻¹) and it was on par with Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉) as mentioned in Fig.4

At 40-60 DAS the highest range of crop growth rate was observed in RDF alone (T₁₀) (2.58 g m⁻²day⁻¹) and it was significantly on par with Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄) on the other hand least value obtained was Control (T₁) it was significantly on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂) Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅), Vermicompost 50% + RDF 50% + 2% Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉) The higher leaf area index (LAI) observed in blackgram under integrated nutrient management treatments may be attributed to increased

Comment [RL7]: Provide a tabular presentation of the results for clear appreciation of relationships of the different variables / parameters employed.

growth parameters. This could be a result of enhanced activity of meristematic tissues in plants, facilitated by the availability of adequate nutrients for an extended period. As a consequence, there is greater cell differentiation, meristematic division, and translocation of food materials within plants. These processes ultimately lead to the production of a greater number of branches at different stages of growth. (Behera and Mohapatra 2022) as mentioned in Table 2

3.3 Yield Parameters

3.3.1. Grain Yield

The data collected in this experiment has the highest yield on RDF (T₁₀) alone (950 kg ha⁻¹) which was statistically on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂), Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅), Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer (T₇), Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈) at harvest and it was lesser in range at Control (T₁) (597 kg ha⁻¹) which was significantly on par with, Vermicompost 50% + RDF 50% + 2% *Pleurotus. sp* +2% Urea (T₉) at harvest as mentioned in Table 3

3.3.2. Halum yield

From these observed data, this parameter shows a higher haulm yield in RDF (T₁₀) (2405 kg ha⁻¹) and it was on par with Vermicompost 100% (on N Equivalent basis)+ 2% TNAU Biomineralizer (T₃), Vermicompost 100% (on N Equivalent basis)+ 2% Effective Microorganism (T₄), and the lesser value ranges in Control (T₁)(1463 kg ha⁻¹) it was statistically on par with Vermicompost 100% (on N Equivalent basis)+ 2% Cowdung slurry (T₂) Vermicompost 100% (on N Equivalent basis)+ 2% *Pleurotus.sp*+ 2%Urea (T₅), Vermicompost 50% + RDF 50% + 2% TNAU Biomineralizer (T₇), Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% Cowdung Slurry (T₆), Vermicompost 50% + RDF 50% + 2%Effective Microorganism (T₈), Vermicompost 50% + RDF 50% + 2% *Pleurotus.sp* +2% Urea (T₉) at harvest as mentioned in table 3 and Fig 5

The utilization of an integrated nutrient management system that combines organic inputs such as farmyard manure (FYM) with chemical fertilizers has proven to be an effective approach in achieving higher Grain and Halum yield and improving yield attributes. This success can be attributed to several factors. Firstly, the inclusion of organic inputs helps to maintain a balanced carbon-to-nitrogen (C:N) ratio, which promotes vegetative growth and stimulates the synthesis of carbohydrates. This, in turn, contributes to an overall improvement in seed yield. Additionally, the application of fertilizers plays a significant role in enhancing plant growth and brings about positive changes in various yield-related characteristics. Ultimately, the increased seed yield observed can be primarily attributed to the improved plant growth and the subsequent positive effects on yield-related attributes resulting from the application of fertilizers (Jangir *et al.*, 2016)

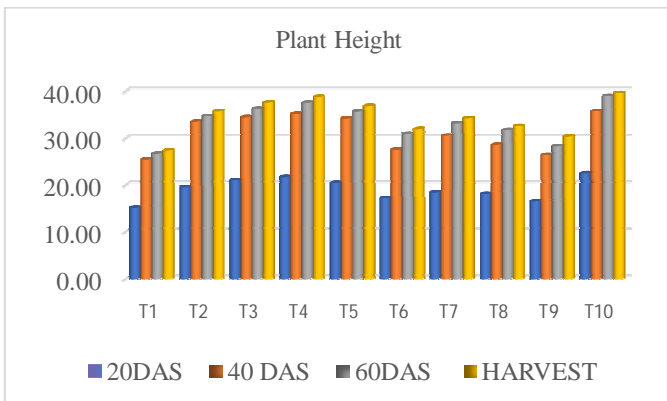


Fig.1. Influence of vermicompost and other foliar application on plant height of Irrigated Blackgram

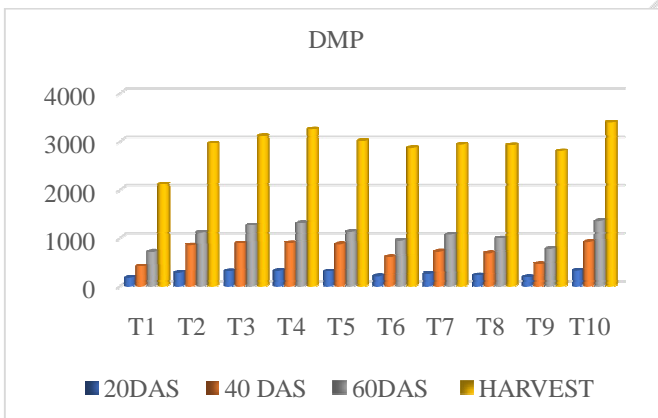


Fig.2. Influence of vermicompost and other foliar application on Dry Matter Production of Irrigated Blackgram

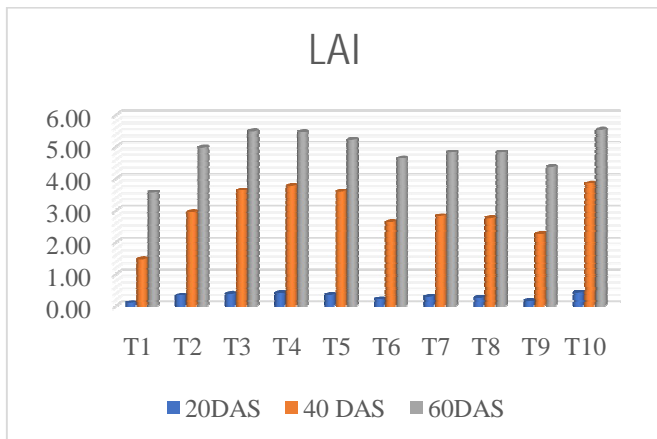


Fig.3. Influence of vermicompost and other foliar application on Leaf area index of Irrigated Blackgram

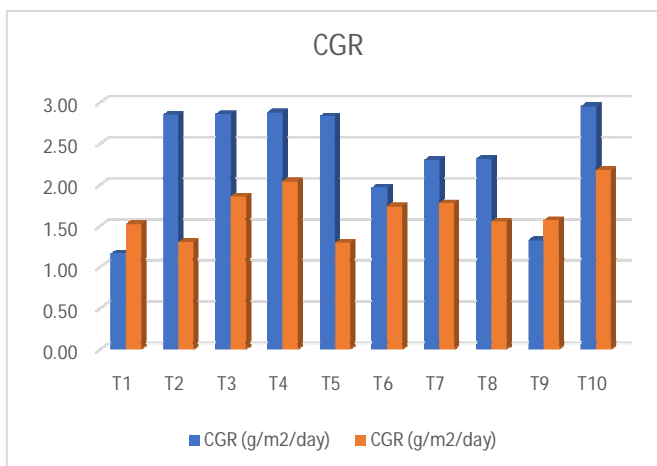


Fig.4. Influence of vermicompost and other foliar application on the Crop growth rate of Irrigated Blackgram

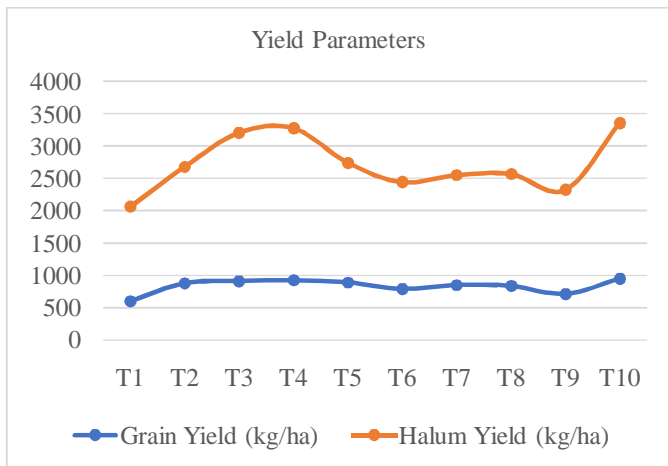


Fig.5. Influence of vermicompost and other foliar application on Yield parameters of Irrigated Blackgram

UNDER PEER REVIEW

Table.1. Influence of vermicompost and other foliar application on Growth parameters of Irrigated Blackgram

Treatment s	Plant height (cm)				DMP (kg ha ⁻¹)			
	20DA S	40 DAS	60DA S	HARVES T	20DA S	40 DAS	60DA S	HARVES T
T ₁	15.20	25.47	26.69	27.39	170	402	706	2100
T ₂	19.56	33.47	34.69	35.71	275	845	1105	2953
T ₃	21.02	34.49	36.26	37.64	309	880	1251	3105
T ₄	21.73	35.20	37.59	38.79	317	893	1301	3245
T ₅	20.45	34.23	35.67	36.83	298	864	1123	3006
T ₆	17.23	27.61	30.98	31.89	205	598	945	2863
T ₇	18.42	30.56	33.19	34.29	250	710	1065	2932
T ₈	18.10	28.54	31.72	32.58	220	683	993	2920
T ₉	16.50	26.39	28.29	30.43	185	450	763	2800
T ₁₀	22.52	35.76	38.93	39.66	320	910	1345	3390
SE (d)	1.89	3.07	3.29	3.40	25.49	73.67	106.0	290.16
							9	
CD p=0.05	3.99	6.51	6.97	7.21	53.97	155.97	224.6	614.32
							2	

T₁ - Control, T₂ . Vermicompost 100% (on N Equivalent basis)+ Cowdung slurry

T₃ .Vermicompost100% (on N Equivalent basis)+TNAU Biomineralizer, T₄ -Vermicompost 100% (on N Equivalent basis) + (Effective microorganism), T₅ . Vermicompost 100% (on N Equivalent basis) + *Pleurotus sp* + Urea, T₆ . Vermicompost (50%) +RDF (50%) + Cowdung slurry, T₇. Vermicompost (50%) +RDF (50%) + TNAU Biomineralizer, T₈ .Vermicompost (50%) + RDF (50%) + EM (Effective Microorganism), T₉ .Vermicompost (50%) + RDF (50%) + *Pleurotus* sp, T₁₀ - RDF alone

Table.2. Influence of vermicompost and other foliar application on Physiological parameters of Irrigated Blackgram

Treatments	LAI			CGR(g m ⁻² day ⁻¹)	
	20DAS	40 DAS	60DAS	20-40 DAS	40-60 DAS
T1	0.10	1.47	3.56	1.16	1.52
T2	0.32	2.95	4.97	2.85	1.30
T3	0.38	3.62	5.49	2.86	1.86
T4	0.40	3.76	5.46	2.88	2.04
T5	0.35	3.59	5.21	2.83	1.30
T6	0.21	2.63	4.63	1.97	1.74
T7	0.29	2.83	4.82	2.30	1.78
T8	0.25	2.76	4.82	2.32	1.55
T9	0.16	2.25	4.37	1.33	1.57
T10	0.42	3.84	5.53	2.95	2.18
SE (d)	0.03	0.30	0.48	0.24	0.16
CD p=0.05	0.07	0.63	1.01	0.51	0.34

T₁- Control ,T₂ .Vermicompost 100% (on N Equivalent basis)+ Cowdung slurry

T₃ .Vermicompost100% (on N Equivalent basis)+TNAU Biomineralizer,T₄ -Vermicompost 100% (on N Equivalent basis) + (Effective microorganism),T₅ . Vermicompost 100% (on N Equivalent basis) + *Pleurotus sp* + Urea, T₆. Vermicompost (50%) +RDF (50%) + Cowdung slurry, T₇. Vermicompost (50%) +RDF (50%) + TNAU Biomineralizer, T₈ .Vermicompost (50%) + RDF (50%) + EM (Effective Microorganism),T₉.Vermicompost (50%) + RDF (50%) + *Pleurotus*sp,T₁₀ - RDF alone

Table.3. Influence of vermicompost and other foliar application on Yield parameters of Irrigated Blackgram

Treatments	Grain Yield (kg/ha)	Halum Yield (kg/ha)
T1	597	1463
T2	875	1800
T3	911	2290
T4	923	2350
T5	889	1849
T6	790	1650
T7	849	1700
T8	835	1730
T9	710	1611
T10	950	2405
SE (d)	82.31	187.44
CD p=0.05	174.26	396.85

T₁ - Control ,T₂ . Vermicompost 100% (on N Equivalent basis)+ Cowdung slurry

T₃ .Vermicompost100% (on N Equivalent basis)+TNAU Biomineralizer,T₄ -Vermicompost 100% (on N Equivalent basis) + (Effective microorganism),T₅ . Vermicompost 100% (on N Equivalent basis) + *Pleurotus sp* + Urea, T₆. Vermicompost (50%) +RDF (50%) + Cowdung slurry, T₇. Vermicompost (50%) +RDF (50%) + TNAU Biomineralizer, T₈ .Vermicompost (50%) + RDF (50%) + EM (Effective Microorganism),T₉.Vermicompost (50%) + RDF (50%) + *Pleurotus*sp,T₁₀ - RDF alone.

Comment [RL8]: Provide a sub-section on **Discussion and Summary of Results** for better integration and overall meaning / relationship of results *vis-a-vis* parameters employed in the study.

Conclusion

In conclusion, this study aimed to evaluate the influence of vermicompost application on the growth and yield parameters of black gram. The results demonstrated that applying a recommended dose of fertilizer (RDF) alone (T₁₀) showed significant improvements in all growth and yield parameters, indicating the high efficacy of vermicompost as an organic fertilizer for enhancing black gram growth and productivity. This highlights the potential of vermicompost as a sustainable and environmentally friendly approach to agriculture, promoting nutrient-rich soil and sustainable crop production.

Furthermore, the study assessed the foliar application of various organic inputs on black gram's growth and yield parameters. The combination of Vermicompost 100% (on N Equivalent basis) and 2% Effective Microorganism (T4) proved to be the most effective treatment, as it exhibited the highest efficacy across all growth and yield parameters. This specific combination of organic inputs demonstrated a significant positive impact on black gram's growth and yield. Additionally, the treatment that combined Vermicompost 50%, RDF 50%, and 2% TNAU Biomineralizer (T7) displayed a wide range of positive effects on growth and yield parameters. These findings suggest a synergistic effect between organic and inorganic inputs when used together, leading to improved outcomes in black gram cultivation.

Reference

1. Amurita N, Maruthi JB, Sarika G, Deepika C. Effect of Integrated Nutrient Management and Spacing on Growth and yield Parameter of black gram CV. LBG-625 (RASHMI), the bioscan. 2015; 10(1):193-198.
2. Anasuyamma, B, Singh, S, Asirinaidu, B, & Abhigna, K. Effect of organic manures and Inorganic fertilizers on the growth and yield of Black gram (*Vigna mungo* L.). *The Pharma Innovation Journal*. (2022); 11(4), 1214-1218.
3. Behera, P. and Mohapatra, A. Effect of integrated nutrient management practices on productivity of blackgram (*Vigna mungo*). 2022.
4. Dwivedi, V. and Singh, T, Influence of Integrated nutrient management on growth, yield and quality of Blackgram (*Vigna mungo* L.). *Journal of Pharmacognosy and Phytochemistry*.2020; 9(5), 1414-1416.
5. Gomez KA, Gomez AA. Statistical procedures for agricultural research 2nd edition. New York. 1984:680
6. Jangir, CK, Singh, D, & Kumar, S. Yield and economic response of biofertilizer and fertility levels on black gram (*Vigna mungo* L.). *Prog Rese An Int J*.(2016); 11(Special-VIII), 5252-5254.
7. Kumar, Y, Basu, S, Goswami, D, Devi, M, Shivhare, U.S. and Vishwakarma, R.K., Anti-nutritional compounds in pulses: Implications and alleviation methods. *Legume Science*. 2022; 4(2), 111.
8. Singh, N, Pulses: an overview. *Journal of Food Science and Technology*.2017; 54, 853-857.

Comment [RL9]: Suggest to consider additional 5-10 references for stronger /solid bases to support the experiment.

UNDER PEER REVIEW

