



Assessment of Different Organic Manures on Yield of Broccoli (*Brassica oleracea* var. Italica Plenck.) cv. KTS-1 under Bundelkhand Climatic Condition

**Dushyant^{a++}, Harpal Singh^{a#}, Vinit Kumar^{bt*},
Abhishek^{a++}, Aakash Pateriya^{c++}, Sanjeev Yadav^{a++}
and Km Ku Karishma^{a++}**

^a Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh), India.

^b Department of Environmental Sciences, Bundelkhand University, Jhansi (Uttar Pradesh), India.

^c Dr. B.R. Ambedkar University of Social Sciences, (Mhow) (Madhya Pradesh), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.9734/jeai/2024/v46i113050>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

<https://www.sdiarticle5.com/review-history/126175>

Original Research Article

Received: 03/09/2024

Accepted: 07/11/2024

Published: 15/11/2024

ABSTRACT

Aims: The organic content in manure helps soil retain moisture, increases gas exchange, and introduces beneficial bacteria, loosens clayey soil, promoting root growth. Soil with a higher organic content is more resistant to erosion and produces superior crops. Using organic manure decreases

⁺⁺ MSc. (Ag.) Horticulture- Scholar;

[#] Assistant Professor;

[†] Professor & Head

*Corresponding author: E-mail: vinitkumarenviro@gmail.com;

Cite as: Dushyant, Harpal Singh, Vinit Kumar, Abhishek, Aakash Pateriya, Sanjeev Yadav, and Km Ku Karishma. 2024. "Assessment of Different Organic Manures on Yield of Broccoli (*Brassica Oleracea* Var. *Italica* Plenck.) Cv. KTS-1 under Bundelkhand Climatic Condition". *Journal of Experimental Agriculture International* 46 (11):267-73. <https://doi.org/10.9734/jeai/2024/v46i113050>.

farming's environmental impact. Unlike synthetic fertilizers, it recycles waste materials, nourishes the soil, and nurtures crops.

Methods: This experiment was carried out during *Rabi* 2023-24 at the Organic Research farm Kargunwan ji, Department of Horticulture, Institute of Agricultural Sciences, Bundelkhand University Jhansi (Uttar Pradesh). Broccoli (*Brassica oleracea* var. *italic* Plenck.) cv. KTS-1 was sown under randomized block design (RBD) with 11 treatment viz., Control, Vermicompost 100%, Cow litter 100%, Pressmud 100%, Vermicompost 75%, Cow litter 75%, Pressmud 75%, Vermicompost 50%+Cow litter 50%, Cow litter 50%+Press mud 50%, Pressmud 50%+Vermi 50%, Pressmud 33%+Cow litter 33%+Vermi 33% with 3 replication accommodating spacing (60 × 45) cm², plot size (2.4 × 1.8) m = 4.32 m² with total gross experimental area of (23.5 × 9.6) m = 225.06 m².

Results: Results shows that at harvest, treatment T₁₀ took to the minimum curd initiation at 53.10 days, compared to the control plot at 68.07 days. Similarly, days to 50% curd initiation and maturity were also shorter in T₁₀, at 67.03 days and 80.13 days, respectively, while the control plot took (78.03 and 96.13) days. Treatment T₁₀ produced the largest curd diameter (14.78 cm) and weight (321.03 g), significantly surpassing the control plot (6.37) cm diameter and (138.43) g weight. Overall, T₁₀ yielded (321.03) q/ha, markedly higher than the control plot (138.43) q/ha, demonstrating significant improvements in broccoli yield and quality.

Conclusion: The results clearly revealed that the application of organic treatments, particularly T₁₀ (Pressmud 33% + Cow litter 33% + Vermi 33%), significantly enhanced the yield and quality of broccoli. This treatment resulted in faster curd initiation and maturity, larger curd diameter, and increased curd weight compared to the control plot. The findings indicate that the strategic use of organic manure can optimize broccoli production, suggesting a viable approach for improving crop outcomes in sustainable agriculture.

Keywords: Broccoli; growth; manure; organic and yield.

1. INTRODUCTION

Broccoli (*Brassica oleracea* var *italic* plenck; 2n=x=18), which is originated from the Mediterranean region commonly known as Hari ghobi in hindi and a member of Cole group, belongs to the family *Brassicaceae* or *Crucifereae* (Wu et al. 2024). The term Cole has originated from the word "Colewart" meaning wild cabbage while the broccoli derived its name from the Latin word Brachium meaning an arm or branch. *Brassica* vegetables possess both antioxidant and anti carcinogenic properties (Cartea& Velasco 2008). It is nutritious vegetable being rich in vitamin (A, B₁, B₂ and C), minerals, calcium, potassium and phytochemicals (sulphoraphane and carbinal) fiber. With the presence of balancing nutrition it may be say as "Crown Jewel of Nutrition". It is rich source of sulphoraphane, a compound associated with reducing the risk of cancer (Chandra 2005). Eating a more broccoli may help in protecting the men from prostate cancer. It has about 130 times more vitamin A contents than cabbage. It contains a few important phyto-chemicals, beta-carotene, indole-3-carbinol which help to fight breast and lung cancer (Meena et al. 2020). The nutritive value of sprouting broccoli per 100g of edible portion is given below: water (89.3%), protein (3.6%), fat (0.2%), carbohydrates (5.5%),

fiber (1.2%), vitamin A (900 I.U.), vitamin B (33 I.U.), vitamin C (137 I.U.), vitamin E (2.3 I.U.), vitamin K (3.5 I.U.), calcium (1.29 mg), manganese (20 mg), Iron (1.3 mg), phosphorus (0.79 mg), and shlpur (1.26 mg) (Gunjal & Gunjal 2021). The area of vegetable crop in India is 9396 thousand hectares with production of 162897 thousand million tons, (Kalia & Sharma 2004).

Farm Yard Manure is a decomposed mixture of dung and urine of farm animal along with waste feeds, fodder, litter, etc. And it is bulky in nature, contains 0.5% N, 0.2% P₂O₅, 0.5% K₂O, (Jouzi et al. 2017). It improves the physical condition and fertility status of soil. Soil Physical condition like soil structure, aeration, water holding capacity etc. It act as cementing agent which bind the soil particle and increase the resistance of soil against soil erosion, (Li et al. 2022).

Vermicompost is prepared by using earth warms, earth warms is used to decomposed different organic waste like agricultural waste (crop residues), plant leaf and weeds etc. It contains approximately 1.5-2.1% N, 1.5-2.1% P₂O₅ and 0.4-0.6% K₂O (Sharma & Garg 2019). Provide excellent effect on plant growth, encourages the growth of new shoot/leaves and improve the quality of produce. It improves the *physico* -

chemical and biological properties of the soil, prevent nutrient losses and increases the chemical fertilizer use efficiency, (Manea and Abbas 2018).

Pressmud is the organic by product from sugar mills which is utilized to provide a nutrient rich, high quality organic matter when it apply to the soil as manure results in better sustainable yield,(Kumar et al. 2023). Pressmud is soft, spongy, amorphous and dark brown white material containing nitrogen, cellulose, lignin, protein, sugar fiber, and coagulated colloids including cane wax, albuminoids, inorganic salts and soil particles and all other carbon containing components available in the final product which are suitable for bio-fuel and fertilizer production as per (Maurya et al. 2008, Meena et al. 2020). Pressmud contains 25-30% Organic matter. Contains Major plant nutrients like N, P, K, Ca, Mg & S and Minor elements like Fe, Zn, Mn, Cu, B & Mo. Saves the cost on inorganic fertilizers by 15- 20%, Improves the structure, texture & quality of the soil, improves the water holding capacity of the soil as this compost contains fibrous material like decomposed coir waste & other Agriculture biomass, (Meena et al. 2020, Nyori et al. 2023). It also minimizes the water like requirement of the crop to some extent, which is rich in beneficial Microorganisms which aid in mineralization of plant nutrients in the soil and make them amenable to the plant roots, (Poria et al. 2022, Sheoran et al. 2020, Verma et al. 2020).

Organic manures are basic sources of nutrients and play a vital role in increasing the efficiency of fertilizer,(Sanga et al. 2018, Sarangi, et al. 2008, Shah and Shrestha 2016). The high cost of fertilizers and very poor purchasing capacity of peasants restricts the use fertilizer under the conditions of escalating energy crisis. The high use of inorganic fertilizer can be reduced and at the same time soil health and environment pollution can be maintained through integrated use of organic sources of nutrients. The organic manures must be cheap, available locally in frequent amount(Kumar et al. 2023,Yadav et al. 2016).

2. MATERIAL AND METHODS

A field experiment Jhansi is situated at latitude 25°27 N, longitude 78°35 E and at an altitude of 271 meters above the mean sea level. The experiment was carried out to record the growth and yield of broccoli, five plants was randomly selected from net plot area of each plot and

tagged. Observations on various growth and yield characters were recorded on tagged five plants. The harvested curd of each plot was carefully observed after each picking to ascertain fruit growth and yield. The observations will be recorded at regular interval. The experiment was conducted using a Randomized Block Design (R.B.D) to ensure the reliability and validity of the results. Each plot had a net size of **2.4 m × 1.8 m**, resulting in a total area of **4.32 m²** per plot. The planting distance was maintained at **60 cm × 45 cm** to optimize space and resource allocation. Spatial Arrangements were accommodating distance between replications 0.5 m, distance between plots 15 cm, main irrigation channel width 1.5 m, sub irrigation channel width 1.0 m, replication border 1.0 m, plot border 0.5 m and field border 1.0 m.

3. RESULTS AND DISCUSSION

3.1 Curd initiation (Days)

Broccoli at final harvest produced curd initiation (days) in minimum days under treatment T₁₀ Pressmud 33% +Cow litter 33% +Vermi 33% (**53.10**) days followed by the treatment T₈ Cow litter 50% + Press mud 50% (**55.13**) days and T₆Pressmud 75% (**56.18**) days. However, maximum curd initiation (days) was produced under the treatment T₀ Control (68.07) days. Data pertaining to days taken for curd initiation (days) as presented in Table1 indicate that different organic manure on yield attributes of Broccoli (*Brassica oleraceae* L.) significantly affected the curd initiation (days) recorded at final harvest. In general, the curd initiation (days) was increased little at initial stage and thereafter curd initiation (days) was increase abruptly at later stages however, a declining trend was recorded at harvesting stage. Similar results were also recorded by (Abdalla et al. 2020, Verma et al. 2020, Zhang et al. 2012).

3.2 Days to 50%Curd initiation (Days)

Broccoli at final harvest produced days to 50% curd initiation in minimum days under treatment T₁₀Pressmud 33%+Cow litter 33%+Vermi 33% (**67.03**) days followed by the treatment T₈ Cow litter 50%+Press mud 50% (**69.73**) days and T₆Pressmud 75% (**70.17**) days. However, maximum days to 50% curd initiation was produced under the treatment T₀ Control (78.03) days. This might have been due to increased organic manure and vermicompost which received reduced doses of RDF in treatment.

Table 1. Effect of different sources of nutrients on Yield parameters

S.no	Treatment	Yield parameters		
		Curd initiation (Days)	50% Curd initiation (Days)	50% Curd maturity (Days)
T ₀	Control	68.07	78.03	96.13
T ₁	Vermicompost 100%	61.08	74.70	92.10
T ₂	Cow litter 100%	60.27	74.80	89.27
T ₃	Pressmud 100%	62.59	74.40	90.93
T ₄	Vermicompost 75%	63.79	75.33	91.57
T ₅	Cow litter 75%	60.29	75.13	93.10
T ₆	Pressmud 75%	56.18	70.17	84.20
T ₇	Vermicompost 50%+Cow litter 50%	64.41	73.17	94.07
T ₈	Cow litter 50%+Press mud 50%	55.13	69.73	82.23
T ₉	Pressmud 50%+Vermi 50%	60.20	75.13	93.10
T ₁₀	Pressmud 33%+Cow litter 33%+Vermi 33%	53.10	67.03	80.13
	C.D at 5%	0.10	0.13	0.08
	SE(m) ±	0.06	0.07	0.02

Table 2. Effect of different sources of nutrients on Yield attributing characters

S.no	Treatment	Yield parameters		
		Curd diameter (cm)	Curd weight (gram)	Yield (q/ha ⁻¹)
T ₀	Control	6.37	138.43	62.10
T ₁	Vermicompost 100 %	8.73	210.40	86.10
T ₂	Cow litter 100%	8.80	230.90	84.25
T ₃	Pressmud 100%	8.47	240.80	85.58
T ₄	Vermicompost 75%	9.27	245.43	86.78
T ₅	Cow litter 75%	9.17	220.63	85.30
T ₆	Pressmud 75%	11.13	297.50	98.21
T ₇	Vermicompost 50%+Cow litter 50%	10.13	176.73	90.16
T ₈	Cow litter 50%+Press mud 50%	12.03	310.03	110.21
T ₉	Pressmud 50%+Vermi 50%	8.80	230.90	84.25
T ₁₀	Pressmud 33%+Cow litter 33%+Vermi 33%	14.78	321.03	121.21
	C.D at 5%	0.28	1.25	0.06
	SE(m) ±	0.09	0.41	0.02

Similar result were also obtained by (Tasci&Kuzucu 2023, Yadav et al. 2016, Thakur et al. 2019).

3.3 Days to 50% Curd Maturity (Days)

Broccoli at final harvest produced days to 50% curd maturity (days) in minimum days under treatment T₁₀ Pressmud 33% +Cow litter 33% +Vermi 33% (**80.13**) days followed by the treatment T₈ Cow litter 50% + Press mud 50% (**82.23**) days and T₆ Pressmud 75% (**84.20**) days. However, maximum days to 50% curd maturity (days) was produced under the treatment T₀ Control (96.13) days. In general, the days to 50% curd maturity (days) was increased little at initial stage and thereafter days to 50% curd maturity (days) was increase abruptly at later stages however, a declining trend was recorded at harvesting stage. In general, the days to 50% curd maturity (days) was increased little at initial stage and thereafter days to 50% curd maturity (days) was increase abruptly at later stages however, a declining trend was recorded at harvesting stage. Similar results were also recorded by (Baligar et al. 2001, Shah and Shrestha 2016, Sheoran et al. 2020, Meem et al. 2024).

3.4 Curd Diameter (cm)

Data pertaining to Curd diameter (cm) as presented in Table 2, indicate that different organic manure on yield attributes of Broccoli (*Brassica oleraceae*) significantly affected the Curd diameter (cm) recorded at final harvest. Broccoli at final harvest recorded maximum Curd diameter (cm) under treatment T₁₀ Pressmud 33% +Cow litter 33%+Vermi 33% (**14.78**) cm followed by the treatment T₈ Cow litter 50% +Press mud 50% (**12.03**) cm and T₆ Pressmud 75% (**11.13**) cm. However, minimum Curd diameter (cm) was produced under the treatment T₀ Control (6.37) cm. Similar findings were in accordance with that of (Maurya et al. 2008, Poria et al. 2022, Sanga et al. 2018, Thakur & Kumar 2021).

3.5 Curd Weight (Gram)

The data regarding Curd weight (gram) as presented in Table 2, indicate that different organic manure on yield attributes of Broccoli (*Brassica oleraceae* L.) significantly affected the Curd weight (gram) recorded at final harvest. Broccoli at final harvest recorded maximum Curd weight (gram) under treatment T₁₀ Pressmud

33%+Cow litter 33%+Vermi 33% (**321.03**) gm followed by the treatment T₈ Cow litter 50%+Press mud 50% (**310.03**) gm and T₆ Pressmud 75% (**297.50**) gm. However, minimum Curd weight (gram) was produced under the treatment T₀ Control (138.43) gm. The present results coincides with those (Sarangi et al. 2008, Tasci&Kuzucu 2023, Verma et al. 2020, Thakur et al.2019).

3.6 Yield (q/ha⁻¹)

The data for Yield (q/ha⁻¹) attributes as presented in Table 2, indicate that different organic manure on yield attributes of Broccoli (*Brassica oleraceae*) significantly affected the Yield (q/ha⁻¹) recorded at final harvest. Broccoli at final harvest recorded maximum Yield (**121.21q/ha⁻¹**) under treatment T₁₀ Pressmud 33% + Cow litter 33% + Vermi 33% (**110.21q/ha⁻¹**) followed by the treatment T₈ Cow litter 50%+Press mud 50% (**98.21 q/ha⁻¹**) with T₆ Pressmud 75%. However, minimum Yield (**62.10 q/ha⁻¹**) was produced under the treatment T₀ Control. Past researches also showed similar and significant results with respect to present study (Li et al. 2022, Maurya et al. 2008, Sanga et al. 2018).

4. CONCLUSION

The curd attributes were maximum under the treatment T₁₀ (Pressmud 33%+Cow litter 33%+Vermi 33%), followed by T₈ (Cow litter 50%+Press mud 50%) and T₆ (Pressmud 75%). While, minimum curd parameters were observed with the treatment T₀ (control).

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors declare Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have not been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Abdalla, M. A., Endo, T., Maegawa, T., Mamedov, A. and Yamanaka, N. (2020). Effectiveness of organic amendment and application thickness on properties of a

- sandy soil and sand stabilization. *Journal of Arid Environments*, **183**, 104273.
- Baligar, V. C., Fageria, N. K., & He, Z. L. (2001). Nutrient use efficiency in plants. *Communications in soil science and plant analysis*, **32**(7-8), 921-950.
- Cartea, M. E., & Velasco, P. (2008). Glucosinolates in Brassica foods: bioavailability in food and significance for human health. *Phytochemistry reviews*, **7**(2), 213-229.
- Chandra, K. (2005). Organic manures. *Regional Centre of Organic Farming*, **34**, 6-46.
- Gunjal, A., & Gunjal, B. (2021). Management of pressmud (agroindustry by-product) by conversion to value-added products: a review. *Proceedings of the Indian National Science Academy*, **87**(1), 11-18.
- Jouzi, Z., Azadi, H., Taheri, F., Zarafshani, K., Gebrehiwot, K., Van Passel, S., & Lebailly, P. (2017). Organic farming and small-scale farmers: Main opportunities and challenges. *Ecological economics*, **132**, 144-154.
- Kalia, P., & Sharma, S. R. (2004). Current researches in hybrid broccoli. *Journal of New Seeds*, **6**(2-3), 109-134.
- Kumar, A., Bajwan, A., Yadav, S., Kumar, R., Kumar, V., Sharma, R. K., ... & Choudhary, D. R. (2023). Growth and trend in area, production and productivity of vegetables in Haryana vis-à-vis India. *The Indian Journal of Agricultural Sciences*, **93**(10), 1120-1125.
- Li, H., Xia, Y., Liu, H. Y., Guo, H., He, X. Q., Liu, Y., ... & Gan, R. Y. (2022). Nutritional values, beneficial effects, and food applications of broccoli (*Brassica oleracea* L. var. *italica* Plenck). *Trends in Food Science & Technology*, **119**, 288-308.
- Manea, A. I and Abbas, K. A. U. (2018). Influence of seaweed extract, organic and inorganic fertilizer on growth and yield broccoli. *International Journal of Vegetable Science*, **24**(6), 550-556.
- Maurya, A. K., Singh, M. P., Srivastava, B. K., Singh, Y. V., Singh, D. K., Singh, S and Singh, P. K. (2008). Effect of organic manures and inorganic fertilizers on growth characters, yield and economics of sprouting broccoli cv. Fiesta. *Indian Journal of Horticulture*, **65**(1), 116-118
- Meena, R. K., Trivedi, S. K., Nama, A., Kumar, L and Mehta, J. (2020). Broccoli: Growth and yield effected by different biofertilizers and inorganic matter—A Review. *Ind. J. Pure App. Biosci*, **8**(3), 149-153.
- Nyori, B., Singh, S., & Saxena, A. K. (2023). Effect of organic manure on growth, yield and economics of sprouting broccoli (*Brassica oleracea* L. var. *italica*) under low hills of Uttarakhand. *The Pharma Innovation Journal*, **12**(4): 493-500
- Poria, V., Jhila, P., Rana, A., Khokhar, J., & Singh, S. (2022). Pressmud: a sustainable source of value-added products. *Environmental Technology Reviews*, **11**(1), 187-201.
- Sanga, L., Jha, A. K., & Thakuria, D. (2018). Nutrient management influenced phytochemical content and biological activities in rhizosphere of broccoli cv. Pushpa. *Journal of Pharmacognosy and Phytochemistry*, **7**(1), 2441-2443.
- Sarangi, B. K., Mudliar, S. N., Bhatt, P., Kalve, S., Chakrabarti, T., & Pandey, R. A. (2008). Compost from Sugar mill press mud and distillery spent wash for sustainable agriculture. *Dyn Soil Dyn Plant*, **2**(1), 35-49.
- Shah, P and Shrestha, J. (2016). Effects of Cattle Urine and FYM on Yield of Broccoli and Soil properties. *Journal of AgriSearch*, **3**(3), 157-160.
- Sheoran, P., Kumar, A., Kumar, A., Raju, R., Sharma, R., Parjapat, K., ... & Singh, A. K. (2020). Impact of pressmud application in reclamation of high RSC irrigation water induced soil sodification and sustaining rice (*Oryza sativa*)-wheat (*Triticum aestivum*) production in Indo-Gangetic Plains. *Indian J. Agric. Sci*, **90**, 206-211.
- Tasci, F. G., & Kuzucu, C. O. (2023). The effects of vermicompost and green manure use on yield and economic factors in broccoli. *Horticulturae*, **9**(3), 406.
- Verma, B. C., Pramanik, P., & Bhaduri, D. (2020). Organic fertilizers for sustainable soil and environmental management. *Nutrient dynamics for sustainable crop production*, **1**(2):289-313.
- Yadav, L. P., Singh, A and Malhotra, S. K. (2016). Growth, yield and quality response of organic broccoli to intercrops and crop geometry. *Indian Journal of Horticulture*, **73**(3), 376-382.
- Zhang, Q. C., Shamsi, I. H., Xu, D. T., Wang, G. H., Lin, X. Y., Jilani, G., ... & Chaudhry, A. N. (2012). Chemical fertilizer and organic manure inputs in soil exhibit a vice versa

- pattern of microbial community structure. *Applied Soil Ecology*, **57**(3):1-8.
- Thakur, D., Kumar, P., & Shukla, A. K. (2019). Impact of foliar feeding of boron supplements on growth, yield contributing characters and quality of cauliflower. In *Biological Forum International Journal* (Vol. 11, No. 2, pp. 77-82).
- Thakur, P., & Kumar, P. (2021). Effectiveness of boron application: soil vs foliar feeding. *The Bioscan*, **16**(1), 01-08.
- Meem, H. Z., Ali, M., Mehedi, M. N. H., Hossain, M. D., & Howlader, P. (2024). Effect of different sources of organic manures on growth and yield of Broccoli. *Research in Agriculture Livestock and Fisheries*, **11**(2), 197-204.
- Wu, Q., Mao, S., Huang, H., Liu, J., Chen, X., Hou, L., ... & Huang, K. (2024). Chromosome-scale reference genome of broccoli (*Brassica oleracea* var. *italica* Plenck) provides insights into glucosinolate biosynthesis. *Horticulture Research*, **11**(5), uhae
- Sharma, K., & Garg, V. K. (2019). Vermicomposting of waste: a zero-waste approach for waste management. In *Sustainable resource recovery and zero waste approaches* (pp. 133-164). Elsevier.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<https://www.sdiarticle5.com/review-history/126175>