



# **Effect of Different Organic Manures and Varieties on Growth Parameter of Sprouting Broccoli (*Brassica oleracea* var. Italica plenck)**

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## **Authors' contributions**

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

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## **ABSTRACT**

Studies on the effect of different organic sources (soil, FYM, cocopeat, vermicompost, neem cake, and poultry manure) and varieties (V<sub>2</sub> Pusa KTS-1 and V<sub>1</sub> Green Head) on different growth attributes in sprouting broccoli (*Brassica oleracea* var. italica Plenck). Experiment was carried out in a randomized block design with three replications at the Department of Horticulture, Babasaheb

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Bhimrao Ambedkar University Lucknow, 226025 (U P), India, during the Rabi season of 2019-2020. We examined different growth parameters such as Plant height, Number of leaves per plant, Stem diameter (mm), Plant spread east-west (cm), Plant spread north-south (cm), Length of leaves, and Width of leaves. We found that growth parameter are highly effected by vermicompost over the poultry manure, while minimums were reported for S (soil) or control, as well as Neemcake, FYM, and cocopeat at all stages. Hence, organic manure (vermicompost) had the highest effects on growth attributes. We found that variety V<sub>2</sub> (Pusa KTS-1) has a significantly greater effect on vermicopost than variety V<sub>1</sub> (Green Head).

**Keywords:** Organic manure; varieties; broccoli; experiment; RBD.

## 1. INTRODUCTION

Sprouting broccoli (*Brassica oleracea* L. var. *italica* Plenck) is commonly known as "Harigobhi" in Hindi. It belongs to the family Brassicaceae and originated in the Mediterranean region. The "Cruciferae family" of vegetables is another name for the Brassicaceae family [1,2]. Tetradyamous conditions have been reported in cruciferous vegetable crops, which have six stamens, four of which are long and two of which are short. Broccoli is an important cole crop for export in the future and is considered a minor vegetable crop. The word broccoli comes from the Latin word brachium and Italian "brocco," meaning "arm" or "branch." Broccoli is more similar to cauliflower, but the main difference is that cauliflower lacks axillary branching. Broccoli plants produce a type of head composed of green or purple buds and thick, fleshy flower stalks [3,4]. The terminal bud is rather loose and green or purple. The large mass of the flower head is surrounded by leaves. It is a new crop in India with high nutritional and medicinal value, as well as being a good source of iron. Sulphoraphane, a compound associated with reducing the risk of cancer Kalia [5], among cole crops, it is a rich source of vitamins, minerals, fiber, and antioxidant substances. It also contains a significant amount of nutrients, such as vitamin A (9000 IU/100g), vitamin B (33 mg/100g), vitamin C (137 mg/100g), and iron (Fe) (205 mg/100g), calcium (80 mg), phosphorus (79 mg), protein (3.3%), carbohydrate (5.5%), magnesium, and selenium Thamburaj et al. [6]. Broccoli also contains the compound glucoraphanin, which is an anticancer compound. Broccoli contains 130 times more vitamin A than cauliflower and 22 times more than cabbage. It must have anti-carcinogenic and antioxidant properties that are beneficial to human health Munger [7].

Chemical fertilizers, pesticide and fungicide are heavily used in modern Indian agriculture. Which

are responsible for the deterioration of soil health [8,9]. Organic vegetable cultivation offers one of the most sustainable farming systems with recurring benefits. To not only long-term soil health but also long-term production stability by importing better resistance against various biotic and abiotic stresses Doklega et al.[10]. Organic manure such as cattle manure, poultry manure, and vermicomposting, all necessary macro and micronutrients are slowly released while cocopeat and neem cake available forms during mineralization [11,12].

Further, organic manure can serve as an alternative practise in place of fertilisers for improving soil structure, aeration, and microbial biomass, minimising global warming, improving the physical and physiological properties of soil, and producing quality crop yields [13,14].

## 2. MATERIALS AND METHODS

Research work is carried out at Horticulture Research Farm-I, Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya Vihar, Rae Bareli Road, Lucknow (U.P.) 226025, during Rabi season 2019–20. Location of research work located 26.56° North latitude, 80.52° East longitude, and 111 m MSL. According to the agro-climatic conditions of Uttar Pradesh state, Lucknow located under the central plains region, where average rainfall of 1000 mm; the climate ranges from 22°C to 45°C in summer and relative humidity ranging from 60 to 80%. The experiment was laid out in a random block design (RBD) with three replications, with two varieties, Pusa KTS-1 and Green Head and spacing is 45 x 45 cm. The treatment combination are: Soil X KTS-1, FYM X KTS-1, Cocopea X KTS-1, Vermicompost X KTS-1, Neem cake X KTS-1, Poultry manure X KTS-1, and Soil X Green Head, FYM X Green Head, Cocopea X Green Head, Vermicompost X Green Head, Neem cake X Green Head, Poultry

manure X Green Head observed data are plant height (cm), number of leaves per plant, length of leaves (cm), width of leaves, plant spread (cm) east-west, plant spread (north-south), stem diameter (mm), number of axillary bud. Data analysis by statistical method following the standard procedure Panse and Sukhatme [15].

width (cm), plant spread (east-west), and plant spread (north-south), stem diameter. Application of 5.0 t ha<sup>-1</sup> of vermicompost significantly increased growth attributes as compared to 5.0 t ha<sup>-1</sup> of poultry manure, while minimums were reported for S (soil) or control, as well as Neemcake, FYM, and cocopeat at all stages.

### 3. RESULTS AND DISCUSSION

#### 3.1 Effect of Organic Manure

The data were collected on a daily basis 30, 45 and 60 DAT. The data presented in the Tables 1,2 reveal a significant effect of organic manure. Among the manures, with respect to plant height, number of leaves, and length of leaves (cm), leaf

#### 3.1.1 Plant height and number of leaves

We found that organic manure V (vermicompost) had the greatest effects on plant height and number of leaves as compared to poultry manure P (poultry manure), which had the least S (soil) at all stages and produced the same results as Nurhidayati et al. [16] and Singh et al. [17].

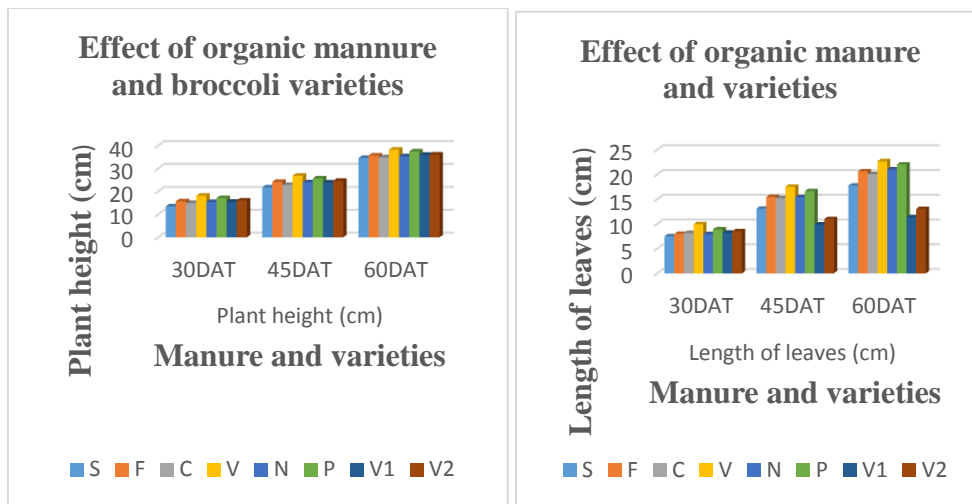


Fig. 1. Shows the effect of organic manure and variety on plant height, Length of leaves

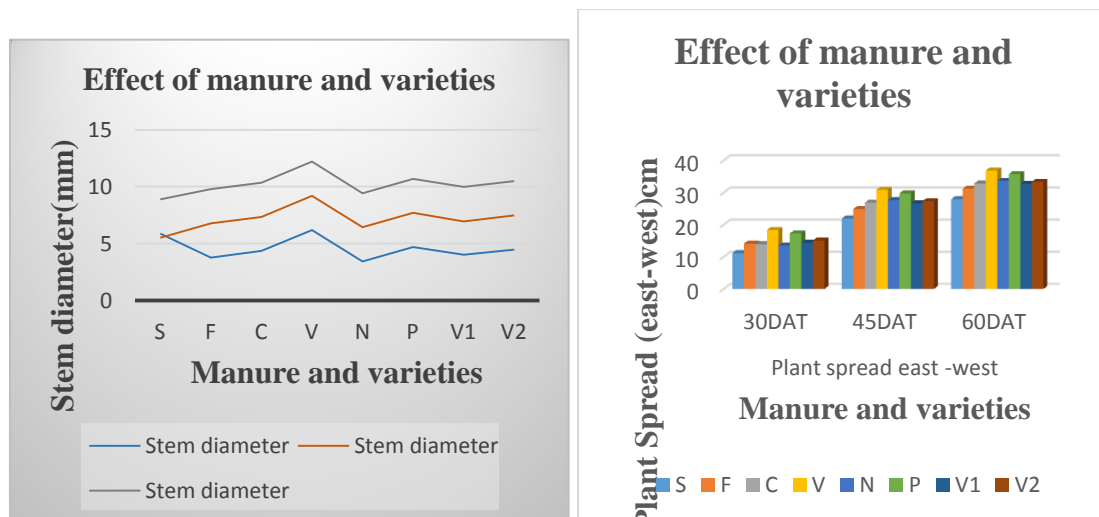


Fig. 2. Shows the effect of organic manure and varieties on stem diameter, plant spread (east-west)

**Table 1. Effect of organic manure and varieties on growth attributes in broccoli crops**

Treatment	Plant height (cm)			Number of leaves			Length of leaves (cm)			Width of leaves (cm)		
	30DAT	45DAT	60DAT	30DAT	45DAT	60DAT	30DAT	45DAT	60DAT	30DAT	45DAT	60DAT
S	13.48	21.73	34.58	4.17	8.50	10.00	7.50	13.05	17.73	4.97	8.07	9.73
F	15.73	24.20	35.67	4.83	9.50	11.50	7.97	15.42	20.62	5.67	8.78	10.78
C	14.92	22.87	34.93	5.67	10.0	12.17	8.15	15.18	20.05	5.77	9.35	11.35
V	18.13	26.85	38.21	7.83	12.5	14.83	9.93	17.50	22.63	7.88	11.20	13.20
N	15.42	24.00	35.35	5.50	10.5	12.0	7.92	15.38	20.97	5.85	8.43	10.43
P	17.10	25.73	37.45	6.67	11.5	12.5	8.87	16.58	21.98	6.08	9.70	11.70
Organic manure												
SEm±	0.19	0.24	0.10	0.46	0.43	0.38	0.15	0.23	0.27	0.17	0.21	0.19
CD at 5 %	0.55	0.69	0.30	1.4	1.28	1.13	0.43	0.66	0.81	0.51	0.62	0.56
Varieties												
V1	15.54	23.86	35.93	4.72	9.89	11.33	8.23	9.89	11.33	5.85	9.03	10.92
V2	16.06	24.61	36.12	6.83	10.94	13.00	8.50	10.94	13.00	6.22	9.48	11.48
SEm±	0.11	0.14	0.06	0.26	0.25	0.22	0.26	0.25	0.22	0.10	0.12	0.11
CD at 5%	0.32	0.40	0.18	0.78	0.74	0.65	0.75	0.74	0.65	0.3	0.36	0.32

S: means (soil); F: means (FYM); C: means (cocopeat); V: means (Vermicopost); N: means (Neem cake); P: means (poultry manure)

**Table 2. Effect of organic manure and varieties on growth attributes in broccoli crops**

Treatment	Stem diameter (mm)			Plant spread (east- west)			Plant spread (north-south)		
	30DAT	45DAT	60DAT	30DAT	45DAT	60DAT	30DAT	45DAT	60DAT
S	5.87	5.50	8.90	11.18	21.95	27.95	14.12	22.65	35.07
F	3.78	6.78	9.78	14.10	24.88	31.22	14.87	24.98	37.30
C	4.35	7.35	10.35	13.95	26.85	32.85	16.68	27.13	38.83
V	6.20	9.20	12.20	18.37	30.86	36.87	18.67	32.32	43.35
N	3.43	6.43	9.43	13.57	27.65	33.65	16.77	25.65	36.57
P	4.70	7.70	10.70	17.32	29.76	35.77	17.95	30.00	42.57
Organic manure									
SEm±	0.21	0.20	0.27	0.25	0.34	0.32	0.28	0.39	0.36
CD at 5%	0.30	0.59	0.67	0.73	0.99	0.95	0.81	1.15	1.06
Varieties									
V1	4.03	6.94	9.98	14.45	26.68	32.74	16.14	26.73	38.57
V2	4.48	7.48	10.48	15.09	27.30	33.36	16.88	27.51	39.31
SEm±	0.12	0.11	0.3	0.14	0.20	0.19	0.16	0.23	0.21
CD at 5%	0.17	0.34	0.38	0.42	0.58	0.55	0.47	0.67	0.61

S: means (soil); F: means (FYM); C: means (cocopeat); V: means (Vermicopost); N: means (Neem cake); P: means (poultry manure)

### 3.1.2 Leaf width

In the case of leaf width, we found V (vermicompost) to be highly affected in comparison to P (poultry manure), while the minimum reported for S (soil) at all the stages had the same result, as reported by Chatterjee et al. [18].

### 3.1.3 Stem diameter

Stem diameter and number of axillary buds are highly and significantly affected by vermicompost; this increases plant growth attributes as compared to poultry manure, while minimums are reported in soil or control. The near-about result was found by Choudhary et al. [19].

### 3.1.4 Plant spread (cm)

While in the cases of plant spread (east-west) and plant spread (north-south), we found vermicompost significantly affected as compared to poultry and very little affected by soil. Similar results were reported by Meena et al. [20] and Mohanta et al. [21].

## 3.2 Effect of Varieties

The findings of the experiment with respect to growth parameters showed a significant effect on varieties. Maximum height, number of leaves, and length of leaves (cm), leaf width (cm), plant spread (east-west), plant spread (north-south) and stem diameter were recorded with maximum varieties V<sub>2</sub> (Pusa KTS-1) as par to V<sub>1</sub> (Green Head) at all stages similar result are reported by Singh et al. [17] and Meena et al. [20].

## 4. CONCLUSION

On the basis of the results obtained in the present investigation. The organic manures showed significant effects on growth parameters, and varieties V<sub>2</sub> were superior because they combined the effects of organic manure on maximum plant height, number of leaves, stem diameter, leaf length, leaf width, and plant spread (east-west). Plant spread (north-south) was measured using the maximum organic manure V (vermicompost) as compared to P (poultry manure), while the minimums are reported S (soil) at all the stages.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Abou El-Magd MM, El-Bassiony AM, Fawzy ZF. Effect of organic manure with or without chemical fertilizers on growth, yield and quality of some varieties of broccoli plants. J. Appl. Sci. Res, 2006;2(10):791-798.
2. Abou El-Magd MM, Zaki MF, Abo Sedera SA. Effect of bio-nitrogen as a partial alternative to mineral-nitrogen fertilizer on growth, yield and head quality of broccoli (*Brassica oleracea* L. var. *italica*). World Appl. Sci. J. 2014;31(5):681-91.
3. Ujjwal V, Singh MK, Naresh RK, Dev P, Singh S. Effect of integrated nutrient management on quality parameters of broccoli (*Brassica oleracea* L. var. *italica*) in light textured soil of Western Uttar Pradesh; 2020.
4. Vesmin L. Effect of integrated nutrient management on the growth and yield of broccoli (*Brassica oleracea* var. *italica*) (Doctoral dissertation, department of soil science, sher-e-bangla agricultural university, sher-e-bangla nagar, Dhaka); 2021.
5. Kalia P. Biochemical assays and yield performances of sprouting broccoli genotypes of Himachal Himalayas. Cruciferae Newsl. 1995;17:90-1.
6. Thamburaj S, Singh N. Textbook of vegetables, tubercrops and spices. Indian Council of Agricultural Research; 2001.
7. Munger HM. Enhancement of horticultural crops for improved health. HortScience. 1999;34(7):1158-9.
8. Kumar P, Kumar S, Meena Rk, Kumar R, Rawat R. Efficacy of biofertilizers on growth, yield and quality of sprouting broccoli (*Brassica oleracea* var. *italic plank*)", cv. pusa broccoli kts-1. plant archives. 2017;17(2):1647-50.
9. Mal D, Chatterjee R, Nimbalkar KH. Effect of vermi-compost and inorganic fertilizers on growth, yield and quality of sprouting broccoli (*Brassica oleracea* L. var. *Italica plenck*). International Journal of Bio-resource and Stress Management. 2014;5(4):507-12.
10. Doklega S, El-Hady A. Impact of organic, mineral and bio-fertilization on broccoli. Journal of Plant Production. 2017;8(9):945-51.
11. Nurhidayati N, Machfudz M, Murwani I. Direct and residual effect of various vermicompost on yield and quality of

- broccoli. Journal Of Applied Sciences Research. 2017;13(8):30-37.
12. Oliveira AP, Ferreira DS, Costa CC, Silva AF, Alves EU. Utilization of cattle manure and earthworm compost on hybrid cabbage production. Horticultura Brasileira. 2001;19:70-3.
  13. Wang D, Shi Q, Wang X, Wei M, Hu J, Liu J, Yang F. Influence of cow manure vermicompost on the growth, metabolite contents, and antioxidant activities of Chinese cabbage (*Brassica campestris ssp. chinensis*). Biology and fertility of soils. 2010;46:689-96.
  14. Zhenyu L, Yongliang M. Effect of vermicompost on soil fertility and growth, quality of cabbage. Zhongguo Nong xue Tong bao= Chinese Agricultural Science Bulletin. 2005;21(12):236-40.
  15. Panse VC, Sukhatme PV. Statistical methods for agricultural workers. ICAR Publications, New Delhi; 1985.
  16. Nurhidayati N, Ali U, Murwani I. Yield and quality of cabbage (*Brassica oleracea* L. var. *Capitata*) under organic growing media using vermicompost and earthworm *Pontoscolex corethrurus* inoculation. Agriculture and Agricultural Science Procedia. 2016;11:5-13.
  17. Singh S, Saxena AK, Nyori B. Consequence of various organic manures on growth, yield and economics of sprouting broccoli (*Brassica oleracea* L. var. *italica*) under low hills of Uttarakhand. The Pharma Innovation Journal; 2022;11(11):735-741.
  18. Chatterjee R, Bandhopadhyay S, Jana JC. Organic amendments influencing growth, head yield and nitrogen use efficiency in Cabbage (*Brassica oleracea* var. *capitata* L.). American International Journal of Research in Formal, Applied & Natural Sciences. 2014;5(1):90-5.
  19. Choudhary S, Soni AK, Jat NK. Effect of organic and inorganic sources of nutrients on growth, yield and quality of sprouting broccoli cv. CBH-1. Indian Journal of Horticulture. 2012;69(4):550.
  20. Meena K, Ram RB, Meena ML, Meena JK, Meena DC. Effect of organic manures and bio-fertilizers on growth, yield and quality of broccoli (*Brassica oleracea* var. *Italica plenck.*) cv. KTS-1. Chemical Science Review and Letters. 2017;6(24):2153-8.
  21. Mohanta R, Nandi AK, Mishra SP, Pattnaik A, Hossain MM, Padhiary AK. Effects of integrated nutrient management on growth, yield, quality and economics of sprouting broccoli (*Brassica oleracea* var. *italica*) cv. Shayali. Journal of Pharmacognosy and Phytochemistry. 2018;7(1):2229-32.

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