Effect of different organic manures and varieties on growth parameter of sprouting broccoli (Brassica oleracea *var.* italica Plenck)

Abstract

Investigate the effect of different organic sources (soil, FYM, cocopeat, vermicompost, neem cake, and poultry manure) and varieties (V_2 Pusa KTS-1 and V_1 Green Head) on different growth attributes in sprouting broccoli (*Brassica oleracea var. italica* Plenck) with 12 treatments. The field experiment was carried out in a randomized block design with three replications at the Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya-Vihar, Rae-Barely Road, Lucknow, 226025 (U P), India, during the Rabi season of 2019-2020. We investigated 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, width of leaves, etc. The application of 5.0 t ha^{-1} of vermicompost significantly increased the growth parameter data taken at 30, 45, and 60 days after planting (DAT) over the application of 5.0 t ha^{-1} of poultry manure, while minimums were reported for S (soil) or control, as well as Neemcake, FYM, and cocopeat at all stages. Hence that organic manure (vermicompost) had the highest effects on the growth parameter over poultry manure (poultry manure) and less effect on soil (soil) at all stages. We found that variety V_2 (Pusa KTS-1) has a significantly greater effect on vermicopost than variety V_1 (Green Head).

Keywords:- Organic manure, Varieties, Broccoli, Experiment, RBD.

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. Tetradynamous 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. 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, 1995),** 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. 2022).** 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, 1999)**.

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Chemical fertilizers and pesticides are heavily used in modern Indian agriculture and fungicides, which are responsible for the deterioration of soil health. 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. 2017**). 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.

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.

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 26.56^0 North latitude, 80.52^0 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 22^0C to 45^0C 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, width of leaves, plant spread (cm) east-west, plant spread (north-south), stem diameter, number of axillary bud. Data analysis by statistical method following the standard procedure.The application 5.0 t ha^{-1} of vermicompost significantly increase growth attributes 30, 45, and 60 days after planting (DAT) as compared to 5.0 t ha^{-1} of poultry manure, while minimums were reported for S (soil) or control, as well as Neemcake, FYM, and cocopeat at all stages.

Result and discussion

Effect of organic manure:-

The data was collected on a daily basis 30, 45 and 60 DAT. The data presented in the Table-1 & 2 reveals a significant effect of organic manure. Among the manures, with respect to plant height, number of leaves, and length of leaves (cm), leaf width (cm), plant spread (east-west), and plant spread (north-south), stem diameter.

A. On 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

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(soil) at all stages and produced the same results as **Nurhidayati et al. (2017) and Singh et al. (2022).**

B. In 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. (2014).**

C. On 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. (2012).**

D. 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. (2017) and Mohanta et al. (2018).**

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), and plant spread (north-south) and stem diameter were recorded with maximum varieties V_2 (Pusa KTS-1) as par to V_1 (Green Head) at all stages similar result are reported by **Singh et al. (2022) and Meena et al. (2017).**

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Table no-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(P=0.05)	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(P=0.05)	0.32	0.40	0.18	0.78	0.74	0.65	0.75	0.74	0.65	0.3	0.36	0.32

In this-1 Table S means (soil), F means (FYM), C means (compost), V means (Vermicopost), N means (Neem cake), P means (poultry manure)

Table no-2 Effect of organic manure and varieties on growth attributes in broccoli crops.

Treatment	Stem diameter			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(P=0.05)	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(P=0.05)	0.17	0.34	0.38	0.42	0.58	0.55	0.47	0.67	0.61

In This Table-2 show that S means (soil), F means (FYM), C means (compost), V means (Vermicopost), N means (Neem cake), P means (poultry manure)

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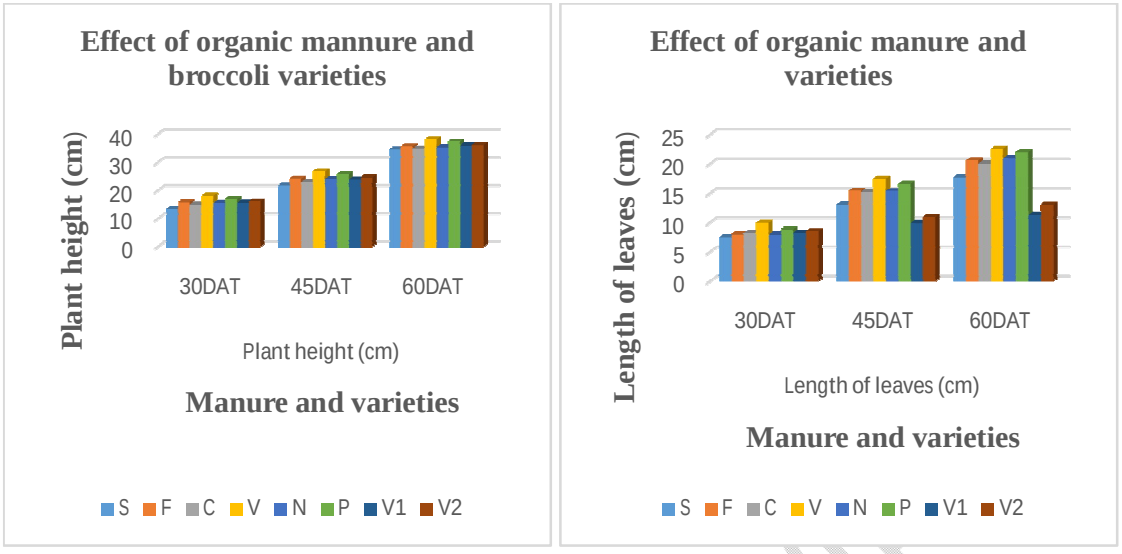

Figure 1 shows the effect of organic manure and variety on plant height, Length of leaves.

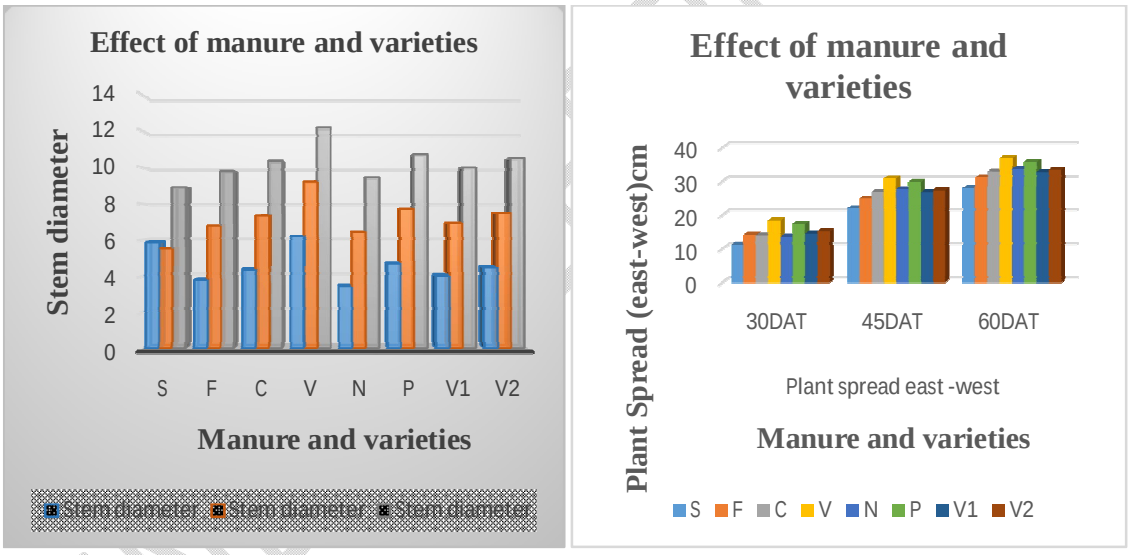

Figure 2 shows the effect of organic manure and varieties on stem diameter, plant spread (east-west).

Conclusion

on the basis of the results obtained in the present investigation. The organic manures showed significant effects on growth parameters, and varieties V_2 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.

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