**Effect of Different Biofertilizers and Organic Manure on Growth and Yield of Cauliflower (*Brassica oleracea* L. var. botrytis.) Cv. Pusa Deepali**

**ABSTRACT**

The experiment was carried out at Agriculture Research Farm of Rama University, Mandhana, Kanpur, India, during 2024-2025 with the goal to assess the effect of bio-fertilizers and organic manure on the growth and yield of cauliflower. The experiment was laid out in a Randomized Complete Block Design (RCBD) with nine treatments and each replicated three times. The results showed that, the highest growth and yield parameters viz., plant height 17.25, Number of leaves 15.84, Leaf length 18.72, Leaf width 15.64, days to first curd emergence 64.22, leaf area index 1.88, curd diameter 10.88, root length 16.88, stalk length 10.74, fresh weight of curd 1.32, dry weight of curd 0.316, yield per plot 28.28, curd yield/ha 276, benefit cost ratio (1.86) was observed with the treatment T5 Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha.The lowest values of these parameters were recorded under control.

**Keywords:** Cauliflower, organic manure, biofertilizer, yield, economic

**INTRODUCTION**

*Brassica oleracea* var. Botrytis L., commonly referred to as cauliflower, possesses a chromosome count of 2n = 2x = 18 and belongs to the Cruciferae family, generally known as the Mustard family. Cauliflower originated in the Mediterranean region. The word cauliflower is derived from two Latin words: 'cavolo’ means cabbage and 'fiore' means flower. It is generally referred to as phoolgobhi in Hindi. Cauliflower can be divided into four groups based on when it is sown and when it matures: early, mid-early, mid-late, and late. In terms of climatic requirements, cauliflower is quite resistant to cold temperatures, making it well suited to cool-season farming. The plant is particularly sensitive to adverse conditions such as hot weather, drought, or low temperatures, which frequently result in the creation of premature heads or curds. India is the world's second-largest producer of vegetables, trailing only China, which produced 204.61 million metric tonnes Anonymous (2022). Curd, or pre-floral fleshy apical meristem, is the edible section of cauliflower. It is farmed for its delicious curd, which is used in raw cocked veggies, curries, soups, and pickles. It is popular because of its appealing appearance, delicious taste, ease of digestion, nutrient-dense content, and high yield. It is an important source of protein, calcium, phosphorus, potassium, sodium, iron, and vitamins.

Biofertilizers improve soil health and plant availability of nutrients, resulting in increased agricultural yields. The delicate stem and immature flower buds of the broccoli plant have a wonderful taste and are high in critical nutrients, including glucoraphanin, which has the potential to be converted into sulforaphane, a chemical recognised for its anti-cancer qualities.

Organic manures have been considered environmentally beneficial and sustainable for agriculture, as they provide slow-release nutrients that improve long-term soil condition (Sastry *et al.,* 2019). Biofertilizers are microbial compounds that help plants flourish by increasing nutrient availability or fixing nitrogen (Sastry *et al.* 2019). One of the most pressing concerns in cauliflower growing is the high nutritional demand, notably for nitrogen, phosphorus, and potassium. Chemical fertilisers have long been used to address these nutrient requirements (Maggoni*et al.,* 2010). However, overreliance on chemical fertilisers can result in environmental degradation, soil nutrient imbalances, and poor soil health. These problems underline the necessity of looking into sustainable alternatives, such as organic manures and biofertilizers, which may provide solutions to improve soil fertility, plant growth, and yields in a more environmentally friendly way (Lim *et al.,* 2013).

**MATERIALS AND METHODS**

The current investigation is entitled Effect of the Different Bio-Fertilizers on and growth and Organic Manures yield of cauliflower.” (*Brassica oleracea* L. var. botrytis.) Cv. Pusa Deepali The study was conducted in the Agriculture Research Farm of Rama University, Mandhana, Kanpur. The experiment was laid out in RBD considering nine treatments with three replications. Different combination of treatmentT0 Control, T1 Farm Yard Manure @25 t/ha, T2 Vermicompost @ 6t/ha, T3 Bio fertilizer (Azotobacter + PSB) @6 kg/ha, T4 Farm Yard Manures @25t/ha + Bio fertilizer (PSB) @6kg/ha, T5 Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha, T6 Vermicompost @ 6t/ha + Bio fertilizer (Azotobacter) @6kg/ha, T7 Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha.The healthy plant of ‘Pusa Deepali’ was brought out from Pusa New Delhi and distance between row to row is 60 cm and plant to plant 30 cm distance with the help of khurpi on 5th oct on 2024-2025 for investigation. After planting we gave light irrigation.Observations were recorded on thirteen characters viz.,height of plant (cm), number of leaves, leaf length (cm), leaf width (cm), leaf area index (LAI), days to first curd emergence, curd diameter (cm), root length (cm), stalk length (cm), fresh weight of curd (kg), dry weight of curd (kg), curd yield plot-1 (kg), benefit cost ratio.

**RESULT AND DISCUSSION**

 The maximum Plant height 17.25 was recorded in T5 Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha, followed by 16.72 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), 15.88 T6 (Vermicompost @ 6t/ha + Bio fertilizer (Azotobacter) @6kg/ha) and 15.12 T4 (Farm Yard Manures @25t/ha + Bio fertilizer (PSB) @6kg/ha), whereas the minimum plant height 12.88 were recorded with control. This result is corroborated with the findings of Thapa *et al.,* (2023).

 The minimum number of leaves 15.84 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 15.12 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha) and 14.88 in T6 Vermicompost @ 6t/ha + Bio fertilizer (Azotobacter) @6kg/ha, whereas the minimum number of leaves 12.94 were recorded with control. This result is corroborated with the findings of Ahmad *et al.* (2020).

 The maximum leaf length 18.72 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 17.88 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha) and 17.22 were recorded T6 Vermicompost @ 6t/ha + Bio fertilizer (Azotobacter) @6kg/ha, whereas the minimum leaf length 14.12 were recorded with control. This result is corroborated with the findings of Kabir *et al*. (2020).

 The maximum leaf width was noted from T5 having Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha. At maturity stage 15.64 cm. This was followed by T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), the leaf width being 14.46 cm at maturity stages respectively, whereas the minimum leaf width 10.92 were recorded with control. This result is corroborated with the findings of Kabir *et al.* (2020),

 The Significantly minimum days required for days to first curd emergence 64.22 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 64.94 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha) and 65.34 were recorded T6 Vermicompost @ 6t/ha + Bio fertilizer (Azotobacter) @6kg/ha, whereas the maximum days to first curd emergence 69.14 were recorded with control. This result is corroborated with the findings of Akhter *et al.* (2019).

 The Significantly maximum leaf area index was noted from T5 having Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha. At maturity stage 1.88. This was followed by T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), the leaf width being 1.68 cm at maturity stages respectively, whereas the minimum leaf area index 0.72 were recorded with control. This result is corroborated with the findings of Akhter *et. al* (2019).

 The maximum curd diameter 10.88 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 10.46 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum curd diameter 8.42 were recorded with control. This result is corroborated with the findings of Patel *et al.* (2023).

 The maximum root length 16.68 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 15.84 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum root length 10.96 were recorded with control. This result is corroborated with the findings of Patel *et al.* (2023).

 The maximum stalk length 10.74 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 10.26 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum stalk length 8.4 were recorded with control. This result is corroborated with the findings of Kabir *et al.* (2020).

 The maximum fresh weight of curd 1.32 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 1.23 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum fresh weight of curd 0.65 were recorded with control. This result is corroborated with the findings of Patel *et. al* (2023).

 The maximum dry weight of curd 0.316 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 0.298 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum dry weight of curd 0.148 were recorded with control. This result is corroborated with the findings of Akhter *et al.* (2019).

 The maximum yield per plot 28.28 were recorded in T5 (Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 26.32 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum yield per plot (kg) 18.24 were recorded with control. This result is corroborated with the findings of Budha *et al.* (2021).

 The maximum curd yield per ha 276 were recorded in T5 Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha), followed by 270 were recorded T7 (Vermicompost @ 6t/ha+ Bio fertilizer (PSB) @6kg/ha), whereas the minimum yield per plot (q) 235 were recorded with control. This result is corroborated with the findings of Ahmad *et al.* (2020).

 The benefit cast ratio was fetched from the treatment T7 (1.86) which was significantly superior over all other treatments except treatment T5 (1.8). The lowest amount of benefit cost ratio was fetched from the treatment T0 (0.7). This result is corroborated with the findings of Kumar and Singh (2022).

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Plant height (cm)** | **Number of leaves** | **Leaf length** | **Leaf width** | **Days to first curd emergence** | **Leaf area index** | **Curd diameter** |
| **T0** | 12.88 | 12.94 | 14.12 | 10.92 | 69.14 | 0.72 | 8.42 |
| **T1** | 13.42 | 13.1 | 14.44 | 11.12 | 68.11 | 0.78 | 8.56 |
| **T2** | 14.92 | 13.98 | 15.78 | 12.78 | 66.24 | 1.12 | 9.46 |
| **T3** | 14.56 | 13.76 | 15.32 | 12.24 | 66.78 | 0.86 | 9.12 |
| **T4** | 15.12 | 14.26 | 16.56 | 13.34 | 65.86 | 1.34 | 9.76 |
| **T5** | 17.25 | 15.84 | 18.72 | 15.64 | 64.22 | 1.88 | 10.88 |
| **T6** | 15.88 | 14.88 | 17.22 | 13.89 | 65.34 | 1.52 | 10.14 |
| **T7** | 16.72 | 15.12 | 17.88 | 14.66 | 64.94 | 1.68 | 10.46 |
| **C.D.** | 6.54 | 2.858 | 5.186 | 7.215 | 6.533 | 4.532 | 1.563 |
| **SEm (±)** | 9.54 | 0.457 | 1.274 | 2.125 | 1.575 | 1.335 | 0.542 |

**Table 1. Effect of Bio-Fertilizers and Organic Manures on growth and yield parameters**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Root length** | **Stalk length (cm)** | **Fresh weight of curd (kg)** | **Dry weight of curd (kg)** | **Yield per plot (kg)** | **Curd yield ha (q)** | **Cost benefit ratio** |
| **T0** | 10.96 | 8.4 | 0.65 | 0.148 | 18.24 | 235 | 0.7 |
| **T1** | 11.12 | 8.12 | 0.7 | 0.156 | 21.66 | 240 | 0.8 |
| **T2** | 13.56 | 9.24 | 0.94 | 0.216 | 23.78 | 260 | 1.26 |
| **T3** | 11.88 | 8.88 | 0.86 | 0.188 | 22.64 | 255 | 0.95 |
| **T4** | 14.64 | 9.68 | 1.1 | 0.256 | 25.12 | 264 | 1.46 |
| **T5** | 16.68 | 10.74 | 1.32 | 0.316 | 28.28 | 276 | 1.8 |
| **T6** | 15.46 | 9.98 | 1.12 | 0.278 | 25.88 | 267 | 1.62 |
| **T7** | 15.84 | 10.26 | 1.23 | 0.298 | 26.32 | 270 | 1.86 |
| **C.D.** | 3.527 | 1.442 | 1.112 | 1.442 | 2.461 | 2.654 | 0.652 |
| **SEm (±)** | 1.543 | 2.165 | 2.232 | 2.854 | 0.514 | 0.577 | 0.545 |

**Table 2. Effect of Bio-Fertilizers and Organic Manures on growth and yield parameters**

**CONCLUSION**

Based on the results obtained from the present investigation, it is conducted that the highest growth and yield parameters viz., plant height 17.25, Number of leaves 15.84, Leaf length 18.72, Leaf width 15.64, days to first curd emergence 64.22, leaf area index 1.88, curd diameter 10.88, root length 16.88, stalk length 10.74, fresh weight of curd 1.32, dry weight of curd 0.316, yield per plot 28.28, curd yield/ha 276, benefit cost ratio (1.86) was observed with the treatment T5 Farm Yard Manures @25t/ha + Bio fertilizer (Azotobacter) @ 5kg/ha. So, we can suggest to farmers for use of Effect of the Different Bio-Fertilizers on and growth and Organic Manures yield of cauliflower.

**Reference:**

Ahmad, Hussain, Z., Alam, M., Ullah, I., Sajid, M., Alam, I., Rehman, A.U., Shah, M.A. and Asif, M., 2020. Effect of organic and inorganic regimes on growth, production and quality characteristics of cauliflower. BIOSCIENCE RESEARCH, 2020 17(2): 1289- 1298.

Akhter, S., Mostarin, T., Khatun, K., Haq, M.E., Soniya, I.A., Mohira, S., Sharmin, I. and Ghosh, A., 2019. Effect of Organic Manure and Its Application Timing on The Growth and Yield of Cauliflower (*Brassica Oleracea* Var. Botrytis). Asian Journal of Agriculture and Horticulture Research, pp. 1-14.

Anonymous, 2022. Ministry of Agriculture and Farmers welfare.

Budha, Rabindra; Yadav, A; Singh, G.K; Shekhar, C. (2021) Effects of integrated nutrient management on growth and yield attribute of cauliflower (*Brassica oleracea* var. botrytis L.). The Pharma Innovation Journal10(9): 1231-1234.

Kabir, M.Y., Shuvra, N.T. and Hera, M.H.R., (2020). Effect of different organic manures and fertilizers on growth and yield of knol-khol (*Brassica oleracea* var. gongylodes L.). Malaysian Journal of Halal Research Journal. ISSN: 2616-1923.

Kameshwar P Patel, BH Panchal, SJ Macwan and Pavan K Patel, (2023), Effect of Bio- NPK and different level of organic manures on growth, yield and qualityof cauliflower (*Brassica oleracea* var. botrytis L.) var. Pusa Snowball K1., Pharma Innovation Journal 2023; 12(9): 1751-1758.

Kumar, R; Singh, BK; Singh, AK; Pal, AK; Singh, Bhagat; Singh, MK; Singh, P; Maurya, RK. (2022). Effect of foliar application of micronutrients on yield and economics of cauliflower (*Brassica oleracea* var. botrytis L.). ThePharma Innovation Journal:11(1): 738-740.

Lim,T.K.(2013).Brassicaoleracea(Botrytis group).In EdibleMedicinalandNon-Medicinal Plants:Volume7,Flowers (pp. 571-593). Dordrecht: Springer Netherlands.

Maggioni,L.,VonBothmer,R.,Poulsen,G.,& Branca, F. (2010). Origin and domesticationof colecrops(*Brassica oleracea*L.):linguisticandliterary considerations. Economic Botany, 64, 109-123

Sastry, K. S., Mandal, B., Hammond, J., Scott, S. W.,Briddon,R.W.,Sastry,K.S.,...& Briddon,R.W.(2019).*Brassica oleracea* var.botrytis(Cauliflower). Encyclopediaof Plant Viruses and Viroids, 302-305.

Thapa C, Pandey S, Kumar V, Kumar M. Effect of Integrated Nutrient Management on Growth and Yield Characteristics of Cauliflower (*Brassica oleracea* var. botrytis L.) cv. Snow Crown. Biological Forum – An International Journal. 2022;14(4):31-39.