



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(6): 340-343

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Received: 22-09-2020

Accepted: 24-10-2020

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Growth, yield and economics of cauliflower (*Brassica oleracea* var. *botrytis* L.) as influenced by use of different combinations of biofertilizers

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DOI: <https://doi.org/10.22271/chemi.2020.v8.i6e.10791>

Abstract

Cauliflower is a cool season vegetable belonging to cruciferae family and important member of cole group. It is a rich source of Vitamin A, C, and minerals. It is widely cultivated in India for its edible 'curds'. Farmers often use chemical fertilizers to harness its maximum yield potential to make it viable commercially. But excessive use of these chemical fertilizers had adversely impacted soil health, environment and other natural resources including human health. Therefore it becomes mandatory to reduce the use of harmful chemical fertilizers. To achieve the objective of sustainable vegetable production along with environmental conservation, Krishi Vigyan Kendra S.A.S. Nagar (Mohali) has planned and conducted on-farm-trials during 2018-19 at five locations in the district. The present investigation was conducted to evaluate the effect of biofertilizers on growth, yield and economics of cauliflower. Biofertilizers are naturally occurring products which have role in fixing atmospheric nitrogen and phosphorus solubilization. Besides they also stimulate plant hormones, improves soil health, and plant nutrient availability resulting in higher and sustainable crops yields. The trial was conducted in randomized block design (RBD) with four treatments and three replications. The treatments comprised T₁: 25 kg biofertilizer Jaivik Prom, 500 g Tricho (contains *Trichoderma viride* and *Trichoderma harzianum*), 250 ml PSB Plus (bio fertilizer based on *bacillus megatherium*, *bacillus polymixa* and *pseudomonas striata* and *pseudomonas ranthonis* bacteria), 500 g Fluorescence (developed through bacteria *pseudomonas Fluorescens*) per acre., T₂: 20 kg biofertilizer Jaivik Khad, 500 g Tricho, 250 ml PSB Plus, 500 g Fluorescence per acre T₃: 2.5 kg bio fertilizer Poshak, 500 g Tricho, 250 ml PSB Plus, 500 g Fluorescence per acre, T₄: No application (Farmers Practice). The results revealed that T₁ provided highest yield (76 q/acre) with maximum BC ratio of 4.04 followed by T₂ (74 q/acre) with BC ratio of 3.96, T₃ (72.5 q/acre) with BC ratio of 3.90 and T₄ with yield of 65 q/acre and BC ratio of 3.60. Similar trend was observed for growth parameters. On the basis of above investigation it can be concluded that use of biofertilizers gave higher yields and better returns as compared to control and application of 25 kg biofertilizer Jaivik Prom, 500 g Tricho, 250 ml PSB Plus, 500 g Fluorescence per acre was found to be the best treatment.

Keywords: Cauliflower, biofertilizers, soil health, economics, sustainable production

Introduction

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is one of the most important member of cole group which belongs to cruciferae family. The word cauliflower was derived from Latin word 'caulis' meaning stalk and 'floris' meaning flower. Cauliflower is rich source of vitamin A, vitamin C and minerals like sodium, potassium, iron, calcium, phosphorus and magnesium. Cauliflower is grown for its edible 'curds' which is prefloral fleshy apical meristem. Cauliflower is widely cultivated throughout the country and Punjab as well. Mohali district of Punjab is sub mountainous zone which is a peri urban area. Many farmers of the district grow cauliflower during winters for their livelihood. To harness the maximum yield potential farmers use lot of chemical fertilizers and pesticides etc. which in turn is causing environmental pollution and adversely affecting fertility and health of soil. Excessive use of chemicals by growers leads to fear among consumers and they are seeking alternative safer and healthy food which might be free from harmful chemical residues. In order to achieve the target of sustainable production along with better economic returns the use of biofertilizers and other safer products of organic origin is only viable option. Bio-fertilizer are naturally occurring products with living microorganisms which are resulted from the roots or cultivated

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soil and don't have any ill effect on plant, soil health and environment. Besides their role in fixing atmospheric nitrogen and phosphorous solubilization, these are also helpful in stimulating the plant growth hormones (Singh and Singh 2019) [11]. Biofertilizers improve the soil health and plant nutrient availability resulting in higher crop yields. The current trend of organic farming using organic fertilizers like biofertilizers of microbial origin with limited use of chemical fertilizers is quite common. So, application of plant nutrients through biofertilizers can maintain soil fertility and crop quality (Narayanmma *et al.* 2005) [6]. Due to excessive use of chemical fertilizers increased vegetable production has been widely recognized but it has detrimental impact on soil health, ecology and other natural resources which affect living organisms and human being (Sable and Bhamare 2007) [9]. Therefore, keeping in view the above facts in mind, an attempt has been made by Krishi Vigyan Kendra SAS Nagar (Mohali) in the present investigation to study the effect of bio-fertilizers on growth, yield and economics of cauliflower (*Brassica oleracea* var. *botrytis* L.) in district Mohali of Punjab.

Material & Methods

Experimental site, treatments and design

Mohali district of Punjab falls under sub-mountainous zone (30.69°N latitude, 76.72°E longitude) having an average altitude of 316 m from the sea level. The present investigation was carried out at five farmer's field each during 2018-19 to evaluate the effect of biofertilizers on growth, yield and economics of cauliflower. The area under each trial was one acre. The soil of the experimental site was deep, loose and sandy loam. The trial was conducted in randomized block design (RBD) with four treatments and three replications. The treatments comprised T₁: 25 kg biofertilizer Jaivik Prom, 500 g Tricho, 250 ml PSB plus, 500 g Fluorescence per acre, T₂: 20 kg biofertilizer Jaivik Khad, 500 g Tricho, 250 ml PSB plus, 500 g Fluorescence per acre, T₃: 2.5 kg bio fertilizer Poshak, 500 g Tricho, 250 ml PSB plus, 500 g Fluorescence per acre, T₄: No application (Farmers Practice). The land was brought to a fine tilth by repeated ploughing and harrowing. The clods were broken and debris was removed. The soil was levelled and raised beds were prepared. For cultivation of crop, recommended package of practices were followed. The recommended practices included sowing of seed in the month of August and transplanting in September. Seed rate for sowing in one acre was 250g. Spacing of 45 cm is kept between ridges and 45 cm in plants. Forty tonnes of farm yard manure per acre was applied. In case of local check (control plots) no change was made in the existing practices of imbalanced use of organic and inorganic fertilizers and indiscriminate use of fungicides and pesticides. Well before the demonstrations, training was imparted to the farmers. Yield data and economic parameters were collected from the demonstration plots and control plots and further cost of cultivation, net income and benefit/cost ratio were computed. The economical assessment was done as per prevailing market prices.

Data collection

Five plants were selected at random from each plot for recording yield. Based on the net plot yield, root yield per hectare was calculated and expressed in quintal (Q) per hectare.

Percent increase was calculated as: Per cent increase = $(\text{Increase/original number}) \times 100$.

Economic analysis

The cost of cultivation and gross returns were worked out by using prevailing market prices of inputs during the period of investigation. Labour and power cost for different operations such as ploughing, weeding, irrigation, sowing, bed preparation and harvesting etc. along with inputs such as seed and bio fertilizers were considered as per market price. Net returns were worked out using formula: Net Returns (Rs/ha) = Gross Returns (Rs/ha) - Cost of cultivation (Rs/ha). Benefit-cost ratio (BCR) was worked out by using the following formula. Benefit: Cost ratio (BCR) = Gross return (Rs/ha) / Total cost of cultivation (Rs/ha).

Statistical analysis was done using standard procedure given by Panse and Sukhatme (1985) [7].

Results & discussion

Growth and yield parameters

The result of present study (Table 1) clearly indicate that days taken to first harvest, plant height, plant spread, number of leaves per plant, weight of curd and marketable curd yield were significantly increased by individual application of different biofertilizers as compared to control. T₃ took minimum days (90) for first harvest whereas T₂ took 92, T₁ took 95 and T₄ took maximum 101 days for first harvest. The earliness in the treatment might be due to quick release of nutrients to soil, quick uptake by plants resulting better vegetative growth, curd initiation and curd maturity as compare to control (Chaterjee *et al.*, 2005) [2]. The maximum plant height (cm) was noticed in T₁ (53.40) followed by T₂ (50.15), T₃ (44.30) and T₄ (40.50) whereas plant spread also showed similar trend in which T₁ recorded maximum plant spread (cm) of (55.65) followed by T₂ (53.12), T₃ (46.60) and T₄ (42.20). Another major growth character is number of leaves per plant were significantly affected with the treatment T₃ (23.63) followed by T₁ (22.350), followed by T₂ (21.15) further followed by T₄ (19.70). It may be due to biological nitrogen fixation because of nitrogen nutrition play vital role in development of plants and influenced physiological activities and a component of protoplasm and chlorophyll were also produced growth regulating substances (Singh *et al.* 2018) [12]. Similar trend in growth characters was observed by Shivran *et al.* 2017 [10] and Meena *et al.* 2017 [5] in Broccoli. The maximum yield and growth observed in T₁ may be attributed to the fact that it comprises organic manure, using remains of medicinal plants, flowers, vegetables, and cattle dung, fortified with Trichoderma, Pseudomonas and Aspergillus at the time of composting. It contains humic acid, amino acid, sea weed and natural nutrients in a balanced manner. It enables plants to fight from diseases and insects. It enhances the immune system of crops and also maintains pH of the soil. T₂ comprises of 10.42 % to 12 % of phosphorus. This product is made of bio residue rock phosphate, khalli, amino acid, plant growth factors and beneficial micro bacteria. It maintains soil structure, provides nutrients to the plants and boosts soil fertility and increases activity and availability of useful bacteria in soil. T₃ comprises of mycorrhizae based granular bio fertilizer in which a micro but very powerful nutrient nano-compound mixture has been prepared. Its mixture is made of humic acid, amino acid, sea grass, natural nutrients and various primitive and important herbs and medicines and mycorrhizae. It provides water, phosphorus and other elements to roots by absorbing them from soil. Maximum weight of curd (g) was found in T₁ which is 550.08 followed by T₂ (510.28) followed by T₃ (435.10) and T₄ (320.20). Maximum marketable yield (q/acre)

was observed in T₁ which is 190 q/ha followed by T₂ (185 q/ha) followed by T₃ (181.25 q/ha) and T₄ (162.50 q/ha). Similar results were observed by Srichandan *et al.* 2015^[13],

Chand *et al.* 2017^[11], Meena *et al.* 2018^[4] and Kumari *et al.* 2019^[3].

Table 1: Effect of different combination of biofertilizers on growth and yield parameters

Treatments	Days taken to first harvest	Plant height (cm)	Plant spread (cm)	No of leaves/plant	Weight of curd (g)	Marketable Yield (q/ha)	% increase over check
T1	95	53.40	55.65	22.35	550.08	190.00	16.92
T2	92	50.15	53.12	21.15	510.28	185.00	13.85
T3	90	44.30	46.60	23.63	435.10	181.25	11.54
T4	101	40.50	42.20	19.70	320.20	162.50	
CD (P=0.05)	3.06	6.11	2.0	NA	15.07	4.07	
SE (mean)	0.87	1.73	0.55	13.8	4.27	1.16	

Economics

The economic analysis describes the methods used in analyzing the economic behaviour and the application of the results obtained to solve the economic problems. The input and output prices of commodities prevailed during the year of investigation were taken for calculating cost of cultivation, net returns and benefit cost ratio. Net profit /ha also depends upon the availability of labour and a suitable market for the disposal of produce. It is clearly evident from the results presented in Table 2 that the treatment T₁ was found to be the most profitable treatment in cauliflower exhibiting highest net return Rs. 255000/- followed by treatment T₂ having net

return Rs. 245000/- further followed by T₃ (Rs. 237500/-) and T₄ (Rs. 200000/-). In terms of cost of cultivation T₄ (Rs. 76922.5/-) was the least expensive followed by T₃ (Rs. 81895/-), T₂ (Rs. 82770/-) and T₁ (Rs. 83880/-) but when we calculate the cost: benefit ratio of all the treatments, T₁ (1:4.04) was the most profitable followed by T₂ (1:3.96), T₃ (1:3.90) and further followed by T₄ (1:3.60). The treatment T₁ was the most beneficial treatment which may be followed for commercial cauliflower cultivation on large scale. The reason of high profitability can be due to lower cost of inputs and higher yield. Similar were the findings of Prasad *et al.* 2018^[8].

Table 2: Effect of different combination of biofertilizers on economic parameters

Treatments	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	BCR
T1	83880/-	338880/-	255000/-	4.04
T2	82770/-	327770/-	245000/-	3.96
T3	81895/-	319395/-	237500/-	3.90
T4	76922.5/-	276922.5/-	200000/-	3.60

Conclusion

From the above study, it was concluded that, in this era of scientific advancements and intensive farming judicious use of chemicals is very important. Apart from the yield and productivity, focus should be made on environment conservation and to minimize pollution. In the present investigation efforts were made to evaluate different combinations of biofertilizers on growth, yield and economics of cauliflower and it was found that use of biofertilizers gave higher yields and better returns as compared to control and application of 25 kg biofertilizer Jaivik Prom, 500 g Tricho, 250 ml PSB Plus, 500 g Fluorescence per acre was found to be best treatment in terms of yield and benefit cost ratio.

References

- Chand P, Mukharjee S, Kumar Vivek. Effect of fertigation and biofertilizers on growth and yield attributes of Sprouting Broccoli (*Brassica oleracea* var. *italica*) cultivar fiesta. International Journal of Pure and Applied Bio Science 2017;5(4):144-149.
- Chatterjee B, Ghanti P, Thapa U, Tripathy P. Effect of organic nutrients in sprouting broccoli (*Brassica oleracea* var. *italica* Planck). Veg. Sci 2005;32(1):51-54.
- Kumari K, Singh SK, Mehmi V, Kumar U, Kaur K. Influence of plant growth regulators and biofertilizers on growth and yield of broccoli (*Brassica oleracea* L var. *italica*) under central region of Punjab. Agriways 2019;7(1):44-49.
- Meena MK, Aravindakshan K, Dhayal M, Singh J, Meena SL. Effect of biofertilizers and growth regulators on growth attributes of cauliflower (*Brassica oleracea* var. *botrytis* L.) cv. Pusa Paushja. Int. J Curr. Microbiol. App. Sci. Special Issue 2018;7:885-890.
- Meena K, Ram RB, Meena ML, Meena JK, Meena DC. Effect of organic manures and biofertilizers on growth, yield and quality of Broccoli (*Brassica oleracea* var. *italica* Plenck.) cv. KTS-1. Chem. Sci. Rev. Lett 2017;6(24):2153-2158.
- Narayanamma M, Chiranjeevi CH, Reddy IP, Riazuddin AS. Integrated nutrient management in cauliflower (*Brassica oleracea* var. *botrytis* L.). Veg. Sci 2005;32(1):62-64.
- Panase VG, Sukhatme PU. Statistical Methods for Agricultural Workers, Indian Council of Agriculture Research, New Delhi 1985.
- Prasad NV, Jyothi UK, Sudhavani V, Sujatha RV, Bhagavati PP, Chandann KSS. Studies on effect of biofertilizers in combination with inorganic nutrients on yield and economics of sprouting broccoli (*Brassica oleracea* var. *italica* L.) International Journal of Chemical Studies 2018;6(5):1337-1339.
- Sable PB, Bhamare VK. Effect of biofertilizers (Azotobacter and Azospirillum) alone and in combination with reduced levels of nitrogen on quality of cauliflower cv. snowball-16. Asian J. Hort 2007;2(1):215-217.
- Shivran BC, Meena ML, Meena DC, Kherwa RS, Narolia SL. Impact of bio fertilizers and zinc on growth and yield of sprouting broccoli (*Brassica oleracea* var *italica* L. Plenck) under Lucknow conditions. Chem. Sci. Rev. Lett 2017;6(24):2562-2568.
- Singh G, Singh SK. Effect of bio-fertilizer and mulching on growth, yield and quality of cauliflower (*Brassica*

- oleracea* var. *botrytis* L.) in central region of Punjab. Journal of Pharmacognosy and Phytochemistry 2019;8(2):2251-2254.
12. Singh SK, Singh DK, Singh PK, Singh SK, Adarsh A, Tej Pratap. Effect of integrated nutrient management on growth, quality, yield and economics of cauliflower (*Brassica oleracea* var. *botrytis*). Bulletin of Environment, Pharmacology and Life Sciences 2018;7(3):8-11.
13. Srichandan S, Mangaraj AK, Behera KK, Panda D, Das AK, Rout M. Growth, yield and economics of Broccoli (*Brassica oleracea* var *italica*) as influenced by organic and inorganic nutrients. International Journal of Agriculture, Environment and Biotechnology 2015;8(4):965-970.