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Study on the impact of application of chemical fertilizers, organic manures and bio-inoculants on growth parameters of cauliflower

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Abstract
The present investigation "Study on the effect of application of chemical fertilizers, organic manures and bio-inoculants on growth parameters of cauliflower" during rabi season of 2019-20. Fourteen treatments of different combinations were applied in the experiments. The plant growth parameters observed at three time periods under 30, 45 and 60 DAT included plant height (cm) (25.67, 34.57 and 42.87), number of leaves (10.04, 15.78 and 17.81), leaf length (cm) (15.27, 21.23 and 27.78), leaf width (cm) (9.86, 12.40, 13.85) was recorded maximum in the treatment T_2 RDF (NPK 100:80:80) respectively. Maximum petiole diameter (1.51) per plant was recorded at 60 DAT in T_2 treatment RDF (NPK 100:80:80) and in the practice of farmers at the beginning of the first curd T_{14} (F.Y.M @ 1 ton/ha + Urea + D.A.P (about 100:40) (48.487) was found. Maximum diameter of curd (17.58), stalk diameter per plant (1.51) at 60 DAT was recorded in the treatment T_2: R.D.F (NPK 100:80:80 kg/ha.). The 50 percent curd initiation of Cauliflower per plant (64.97) at DAT was recorded in the treatment T_{14}. Direct relation to different growth stage of cauliflower. Application of T_2 RDF (NPK 100:80:80) proved to be the next best treatment.

Keywords: Bio-inoculants, organic manure, cauliflower and growth

Introduction
Cauliflower (*Brassica oleracea var. botrytis* L.) is an important crop of Cole crops, which is being grown abundantly in India, due to which its cultivation is increasing widely day by day. This crop are covered in area of 458000 ha area with a production of 884'000 MT (Anon. 2019-20) [1]. Vegetables play a major role in the daily human diet, as they are the most important source of vitamins and minerals, essential for maintaining good health. This for cauliflower is a very important multi nutritionals crops. It contains a good amount of vitamin A and B, protein (2.7%), fat (0.2%) and carbohydrate (5.2%) and some amount of minerals in comparison to other vegetables. The edible portion of cauliflower is approximately 45% of the vegetables as purchased. Cauliflower is sometimes called “rich man’s cabbage” because it is more difficult to grow successfully than cabbage. The edible part contains significant amount of protein, mineral and vitamins along with isothiocyanates and Smethylcysteine sulfoxide which have prominent anticarcinogenic properties (Hazra *et al.*, 2011) [6]. Moderately cool weather and uniformly good supply of soil moisture are essential for its cultivation. It was introduced from England in 1822 by Dr. Jemson, In-charge of Company Bagh, Saharanpur, U.P. The imported seeds were tested in various parts of India. The growers raised the crop during May to July which corresponded with the growing period in England. Cauliflower is a very sensitive crop whose soil type and environmental factors significantly affect its growth and curd yield. Several researches have suggested solutions to this problem, including the use of chemical fertilizers, biofertilizers, and bio inoculation. Improves plant. stimulates plant growth through increased nutrient availability and synthesis of biologically active growth promoting substances, resulting in improved crop growth and yield. The three most important nutrients, without any one of which plants could not survive, are referred to as the primary macronutrients: Nitrogen (N), Phosphorus (P), and Potassium (K). The result reveal, as expected and as mentioned by Chettri, M. and Thapa, U. (2006) [3].
The use of organic-based fertilizers in sustainable agriculture benefits farmers, producers, consumers and the environment in many ways. Empirically demonstrated, organic-based fertilizers help: (1) Boost both nutrient efficiency and organic matter content in the soil.

(2) Nourish the soil with organic matter which reduces dependence on chemical inputs. (3) To restore and maintain soil fertility to nurture plant growth. (4) To increase the biological activity and biodiversity of the soil. (5) To increase the yield as well as the quality characteristics of the produce. Improve the efficiency of nutrient use to produce more vigorous crops. (6) Facilitating the slow release of nutrients in response to the dynamic needs of plants. By using the organic fertilizers the soil physical and biological properties improved due to which the availability of essential nutrients in the soil increased (Yadav *et al.* 2007) [10] and thus increase the growth, yield of the plant (Farahzety and Aisah, 2013) [4].

Biofertilizers are carrier based micro-organisms which help to enhance productivity by biological nitrogen fixation or solubilization of insoluble phosphate or by producing hormones, vitamins and other growth promoters required for plant growth. Ray *et al.*, (2005) [11] reported that okra seeds treated with *Azospirillum*+ 100% NPK + 15 t FYM showed maximum plant height (42.37, 56.97 and 66.18 cm) days after sowing. Kumar and Sharma (2007) [12] revealed that tomato seeds were treated with Azotobacter + 100% NPK + FYM showed maximum plant height (153.20 cm) in both the years of experimentation. Although information on the performance of cauliflower, such experiments have not been done much research in the Satna area of Madhya Pradesh, due to which this information will definitely prove beneficial for the farmer brothers of this area. Keeping this in view, the present experiment was conducted to study the effect of germination with bioinoculants on growth, yield and quality parameters of different cauliflower varieties.

Materials and Methods

The present study was carried out during 2019-20 of Cauliflower(*Brassica oleracea var. botrytis* L.) cv. Local cultivar are working is done at place in research on Horticulture Farm, Department of Horticulture, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Satna, (M.P.), India. This research are done in winter season are months (September to February). The details of treatments is as follows total fourteen are (T_1) F.Y.M @ 20 tons /ha, (T_2) R.D.F (NPK 100:80:80 kg/ha.), (T_3) SPNF (Subhas Palekar Natural Farming) Seed Treatment with Bijamrat+ soil application of Jeevamrat3times1+2 as irrigation at 30 days interval, (T_4) Bio-fertilizers consortium (Azotobacter + PSB) and Bio-enhancer (panchgavya) spray at15 days interval from 20 days, (T_5) 50% F.Y.M + 50% RDF (N.P.K 50:40:40), (T_6) 50% F.Y.M T_4. (T_7) 50%RDF(100:80:80N.P.K/ha.+T_4, (T_8) 25% N equivalent from organic sources +75% RDF (75:60:60 kg), (T_9) 25% N from organic source +T_4, (T_{10}) T_5 (50% N equivalent from organic source +50% from chemical+ T_4, (T_{11}) T_8 25% N + T_4, (T_{12}) Zerobudget (SPNF)Bio-inoculants (panchgavya), (T_{13}) T_3 50% F.Y.M +T4 + Bio-inoculants (panchgavya) and (T_{14}) Farmer practice(F.Y.M@ 1tons/ha + urea + D.A.P (Aprox 100:40). First of all we prepare the nursery, to prepare the nursery we prepare the nursery bed properly then treat the bed with (*Trichoderma virdi*) and also treat the seed with fungicide (Mancozeb 2 g /kg) September 18 We sow and give water from time to time and protect from pests and diseases and when the plant is one month old we plant it in the main field. After that the main field is plowed and beds are made and transplanted in the main field on 18th October 2019. Thirty days old healthy seedling having two pairs of leaves with a height of 10 to 15 cms were selected from the nursery and roots of the plant were treated first with *Azospirillum* treatment before transplanting and transplanted at the experimental plot and given light irrigation. In order to maintain uniform stand of the crop in each plot, the dead seedling were located 8 days after transplanting and replaced with new ones of the same age. To protect the plants from insects and pests, the nursery beds are sprayed with Imidacloprid @ 2 ml/l and Bavistin @ 2 g/l of water at 13th and 23rd days after seed sowing.

Observations were recorded on five randomly selected plants of each treatment to assess the effect of treatments on growth and development of the Cauliflower in the following characters. All the recorded observations were subjected to the statistical analysis.

Impact of the chemical fertilizers, organic manures and Bio-inoculantson different growth parameters of Cauliflower recorded at 30, 45 and 60 DAT plant height (cm), length of leaves (cm), No. of leaves, width of leaves (cm), Days of first harvest, stalk diameter, curd initiation and diameter of curd.

Statistical analysis

The statistical analysis was carried out for each observed character under the study using MS-Excel, OPSTAT. The data generated from these investigations were analysed as described by Gomez and Gomez (1983) [13] by applying randomized block design (RBD).

Results and Discussion

The data pertaining to various growth and development characteristic are different treatments of cauliflower (local cultivars) are presented in (Table no. 1). The leaf length was measured with the help of scale and digital Vernier Callipers it was expressed in centimetres (cm).

The data relating to plant height (cm), number of per leaf plant were recorded at 30, 45 and 60 DAT in maximum (25.67, 34.57 and 42.87) and (10.04, 15.78 and 17.81) was recorded in that treatment T_2 RDF (NPK 100:80:80) and minimum was (17.70, 23.76 and 31.00) and (8.30, 12.02 and 13.31) was found in T_{14} Farmer practices FYM @ 1 t ha^{-1}+ Urea + DAP (approx 100:40). The result reveal, as expected and as mentioned by Chaterjee *et al.*, (2005) [14] and Wani *et al*, (2011) [15]. Length of leaf (cm) and width (cm) was recorded in highest (15.27, 21.23 and 27.78) and (9.86, 12.40, 13.85) at 30, 45, 60 DAT was treatment T_2 RDF (NPK 100:80:80). Whereas the minimum is (10.69, 16.40 and 21.55) and (7.16, 9.47 and 10.54) was found in T_{14} Farmer practices FYM @ 1 t ha^{-1}+ Urea + DAP (approx 100:40). Nitrogen is the part of chlorophyll pigment which helps in photosynthesis. More photosynthesis leads to more plant growth in terms of more plant height. The same results were also reported by Sharma and Sharma (2010) [8] also reported significant improvement in plant height, number of leaves per plant, curd diameter, curd depth, gross weight/plant and marketable curd yield when cauliflower was treated with inorganic fertilizers in presence of biofertilizers.

The maximum stalk diameter per plant (1.51) at 60 DAT was recorded in the treatment T_2 RDF (NPK 100:80:80) followed by T_1 and T_4 and minimum stalk diameter per plant (1.12) was found in T_{14}. Early curd initiation per plant (48.47) DAT was found in T_{14} and was noticed in (60.37) at DAT was recorded in the treatment T_2. The 50 percent curd initiation of Cauliflower in plants in field are earlier noticed in (64.97) DAT in T_{14} and late in all other treatment for T_2 RDF (NPK

100:80:80) (74.67) was recorded. Similar types are results was observed in research is done by Chettri and Thapa (2006) [3] that application of five biofertilizers along with PBG with different concentration urea and Na. Similar findings were also reported by Thilagam *et al.* (2011) [9] and Chatterjee *et al.* (2012) [2]. HCO_3 + inoculated with *Azotobacter* and Phosphobacteria + 100 % NP (100 kg ha^{-1}).

The maximum diameter of curd (17.58) was recorded in the treatment T_2 R.D.F (NPK 100:80:80 kg/ha.) and minimum diameter of curd (10.98) was found in T_{14}: Farmer practices FYM @ 1 t ha^{-1}+ Urea + DAP (approx 100:40). These results are in accordance with the findings of Gorakh *et al.* (2011) [5], Chatterjee *et al.* (2012) [2] and Kanaujia and Singh (2012) [7].

Table 1: Impact of the chemical fertilizers, organic manures and Bio-inoculants on Plant height (cm), No. of leaves, Leaf length (cm), Leaf width (cm), Stalk diameter, Curd initiation, 50% curd initiation and Diameter of curd (cm) Cauliflower (*Brassica oleracea* var. *Botrytis*) cv. Local cultivar at different intervals during of crop growing period

S.No	Treatments No.	Plant height (cm)			No. of leaves			Leaf length (cm)			Leaf width (cm)			Stalk diameter	Curd initiation	50% curd initiation	Diameter of curd (cm)
		At 30 DAT	At 45 DAT	At 60 DAT	At 30 DAT	At 45 DAT	At 60 DAT	At 30 DAT	At 45 DAT	At 60 DAT	At 30 DAT	At 45 DAT	At 60 DAT	At 60 DAT	Days	Days	At 60 DAT
1	T_1	23.40	31.29	37..39	9.93	13.58	16.11	13.05	18.62	25.11	8.93	10.96	11.96	1.15	51.53	65.73	16.29
2	T_2	25.67	34.57	42.87	10.04	15.78	17.81	15.27	21.23	27.78	9.86	12.40	13.85	1.51	60.37	74.63	17.58
3	T_3	23.37	31.50	36.93	9.75	13.50	15.45	12.13	18.35	24.71	8.49	10.54	11.83	1.22	51.43	65.33	16.06
4	T_4	23.27	30.41	36.87	9.70	12.62	15.19	12.07	18.26	24.46	8.46	10.46	11.49	1.07	50.51	65.27	16.05
5	T_5	24.00	32.47	39.53	10.15	13.95	16.38	13.63	19.49	26.47	9.21	11.49	12.40	1.37	52.80	67.70	16.67
6	T_6	22.37	29.80	34.83	8.35	12.25	14.32	11.32	16.59	23.01	7.85	9.83	10.97	1.08	49.80	65.40	14.03
7	T_7	24.27	32.67	39.73	10.36	14.01	16.38	13.82	19.63	26.63	9.312	11.52	12.99	1.37	52.98	67.87	16.68
8	T_8	25.03	33.70	40.67	10.81	14.61	16.86	14.07	19.84	27.31	9.63	11.99	13.19	1.48	54.90	69.10	17.49
9	T_9	22.53	30.30	36.63	9.42	12.34	14.60	11.93	16.72	23.93	8.23	9.99	10.99	1.12	49.13	65.27	15.60
10	T_{10}	24.3	33.03	39.93	10.69	14.40	16.60	14.06	19.72	26.92	9.47	10.66	13.00	1.44	53.70	68.77	16.91
11	T_{11}	25.53	33.75	41.00	10.86	14.85	17.24	14.66	20.27	27.42	9.69	12.19	13.80	1.50	54.90	69.23	17.52
12	T_{12}	23.83	31.67	38.40	10.04	13.76	16.31	13.30	9.14	26.32	9.19	11.33	12.23	1.23	52.43	67.43	16.48
13	T_{13}	23.47	31.50	38.13	9.98	13.59	16.22	13.06	18.97	25.60	9.16	11.23	11.99	1.14	52.03	66.57	16.32
14	T_{14}	17.70	23.76	31.00	8.30	12.02	13.31	10.69	16.40	21.55	7.16	9.47	10.54	1.12	48.487	64.97	10.98
	S.Ed. (±)	0.97	2.00	2.67	0.48	1.01	1.19	1.13	1.22	1.94	1.53	1.81	1.87	0.11	3.08	5.90	1.14
	C. D. at 5%	2.84	5.85	7.80	1.41	2.95	3.46	3.31	3.56	5.67	4.48	5.29	5.46	0.32	9.00	17.21	3.33

Conclusion

Maximum number of leaves, length and width of leaves, diameter of corolla etc. in local cultivar and using recommended biological regime effect to obtain high yielding and best quality cauliflower for growing in Satna, (M.P.) It was concluded that R.D.F. NPK 100:80:80 kg/ha) provides better growth, yield factor and quality under agro-ecological condition.

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Reference

1. Annonymous. Horticulture Data Base, National Horticulture Board, Ministry of Agriculture, Government of India, Gurgaon; c2019. p. 146-53.
2. Chatterjee R, Jana JC, Paul PK. Enhancement of head yield and quality of cabbage (*Brassica oleracea*) by combining different sources of nutrients. Indian J Agric. Sci. 2012;82(4):323-327.
3. Chettri M, Thapa U. Effect of biofertilizers and plant growth promoting bacteria on growth attributes and tuber yield of potato (*Solanum tuberosum* L.). Haryana J Hort. Sci. 2006;35**(**1-2):143-145.
4. Farahzety AM, Aishah HS. Effects of organic fertilizers on performance of cauliflower (*Brassica oleracea var. botrytis*) grown under protected structure. J Trop. Agric. and Fd. Sci. 2013;41(1):15-25.
5. Gorakh N, Singh DK, Singh K. Productivity and nematode management through vermicompost and biopesticides in Brinjal (*Solanum melongena* L.). World Appl. Sci. J. 2011;12(4):404-412.
6. Hazra P, Chattopadhyay A, Karmakar K, Dutta A. Cauliflower: In Modern Technology in Vegetable Production. New India Publishing Agency New Delhi; c2011. p. 140-54.
7. Kanaujia SP, Singh VB. Effect of integrated nutrient management on growth, yield and quality of cabbage (*Brassica oleracea var. capitata*). J Soil. Crop. 2012;22(2):233-239.
8. Sharma KC, Sharma LK. Effect of biofertilizers and NPK levels on growth and yield of mid-maturity group of cauliflower under mid hill sub-humid conditions of Himachal Pradesh. J Hill Agric., 2010;1:19-22.
9. Thilagam VK, Lalitha M, Natesan R. 'Integrated nutrient management for sustaining cauliflower productivity - a review'. Agric. Rev. 2011;32(1):26- 31.
10. Yadav M, Chaudhary R, Singh DB. Performance of organic and inorganic fertilizers on growth and yield of cauliflower (*Brassica oleracea var. botrytis* L.). Plant Arch. 2007;7(1):245-246.
11. Ray G, Muhanna WA, Barney JB. Information technology and the performance of the customer service process: A resource-based analysis. MIS quarterly. 2005 Dec 1:625-652.
12. Baqui AH, Williams EK, Darmstadt GL, Kumar V, Panwar D, Sharma RK, *et al*. Newborn care in rural Uttar Pradesh. The Indian Journal of Pediatrics. 2007 Mar;74:241-247.
13. Frank C, Woo SY, Amiel D, Harwood F, Gomez M, Akeson W. Medial collateral ligament healing: A

multidisciplinary assessment in rabbits. The American journal of sports medicine. 1983 Nov;11(6):379-389.
14. Chaterjee B, Ghanti P, Thapa U, Tripathy P. Effect of organic nutrition in sprouting broccoli (Brassica oleracea L. var. italica Plenck). Vegetable science. 2005;33(1):51-54.
15. Banerjee A, Wani SH, Roychoudhury A. Epigenetic control of plant cold responses. Frontiers in Plant Science. 2017 Sep 21;8:1643.