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Response of Organic Manures and *Panchagavya* on Yield Attributes of Cauliflower (*Brassica oleracea* L. var *botrytis*)

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ABSTRACT: The present investigation was carried out with organic manures and *Panchagavya* on yield attributes of cauliflower at Technology Park, CTAE, MPUAT, Udaipur during *rabi* season 2021-22. The sixteen-treatment combination comprised of sole and combined application organic manures (FYM and vermicompost) and four levels of *panchagavya* were evaluated on cauliflower crop with three replications under factorial RBD design. The observations recorded for polar and equatorial diameter of curd, fresh weight of curd, volume of curd, yield kg/plot and q/ha of cauliflower. Result showed that among organic manures application of T_4 treatment (50 per cent RDN through FYM and 50 per cent RDN through vermicompost) as soil application recorded maximum polar diameter of curd, equatorial diameter of curd, fresh weight of curd, volume of curd, yield of curd and yield per ha. with 11.60 cm, 14.55 cm, 593.08 g, 671.30 cm^3, 17.16 kg/plot and 295.84 q/ha, respectively. However, *panchagavya* application *i.e.*, treatment T_4 (10 per cent *Panchagavya* spray at 30 and 45 DAT) recorded maximum polar diameter of curd, equatorial diameter of curd, fresh weight of curd, volume of curd, yield of curd and yield per ha. with 10.98 cm, 13.12 cm, 551.75 g, 626.66 cm^3, 15.77 kg/plot and 271.89 q/ha, respectively.

Keywords: Cauliflower, FYM, organic, *panchagavya*, vermicompost.

INTRODUCTION

Vegetables assume a significant function in the realm of human nutrition. Consistently consuming the necessary daily quantity of vegetables which is 300 grams per capita has a positive impact on overall health. In recent times, there has been a significant surge in interest around vegetable production. This may be attributed to a heightened recognition of the nutritional value that vegetables provide, as well as their importance in meeting the dietary needs of the country. Vegetables are a vital category of food that plays a crucial role in delivering essential elements such as vitamins, minerals, protein, carbs and dietary fiber. Additionally, vegetables possess therapeutic properties contributing to nutritional security by offering a diverse range of nutrients. India is recognized as the second biggest global producer of vegetables, after China. The country's contribution to the overall world vegetable output is at 10.7 percent. In the Indian context, the cultivated land area dedicated to vegetable crops measures 10,100 thousand hectares, resulting in a total output of 1.85 lakh thousand MT and a productivity rate of 18.40 MT per hectare. Cauliflower cultivation spans an extensive land area of 469 thousand hectares yielding an annual output of around 9,103 thousand MT (Anon., 2019). The cauliflower, scientifically known as *Brassica oleracea* L.var botrytis, is a significant member of the cole crop family that is cultivated extensively throughout many regions. It belongs to the cruciferae family and has a chromosomal number of 2n = 18. The etymology of the term "cauliflower" may be traced back to its latin origins, specifically the combination of the term's "caulis" meaning cabbage and "floris" meaning flower. The plant is cultivated nationwide due to the soft curds it produces which are often used as a vegetable, in soups and for pickling purposes (Choudhary *et al*., 2003). The primary states where cauliflower cultivation is prominent are Bihar, Uttar Pradesh, Odisha, West Bengal and Maharashtra. Cauliflower, as a crop that requires a significant amount of nutrients and depletes soil resources has a strong positive response to the application of additional nutrients. The nutritional aspect has significant relevance among the different reasons contributing to the poor production of cauliflower. The widespread recognition of the escalating use of chemical fertilizers for enhancing vegetable output has drawn attention to the adverse long-term effects on soil health, ecology and other natural resources. These deleterious consequences extend to living species, including beneficial soil microorganisms and human beings. The increasing costs of chemical fertilizers and their adverse effects on soil health, environmental sustainability and human well-being have necessitated the exploration of alternate nutrient sources for vegetable cultivation. The practice of cultivating crops by the use of organic manures has led to the emergence of organic farming, which is now prevalent. Vermicompost is an organic fertilizer that contains high levels of nitrogen (23%), potassium (1.85-2.25%), and phosphorus (1.55-2.25%). It also contains micronutrients and beneficial soil microbes, such as nitrogen-fixing bacteria and mycorrhiza fungi. Research conducted by Kumar *et al*.

(2013) has demonstrated the remarkable growth-promoting and protective properties of vermicompost. The use of various organic manures such as FYM, vermicompost and *panchagavya* in conjunction with one another contributes to the long-term preservation of soil productivity in a sustainable manner. The available data about the combined application of organic manures and its impact on cauliflower productivity in this particular area is insufficient. Hence, the current study was conducted using a test group consisting of cauliflower.

MATERIALS AND METHODS

The field experiment was carried out at Technology Park, CTAE, MPUAT, Udaipur, Rajasthan during *Rabi* season of 2021-22. Cauliflower variety 'Pusa Snowball K-1' was sown in nursery in the month of October. Four weeks old seedlings were transplanted at spacing 45 × 30 cm. The full doses of FYM, Vermicompost and combination of both were applied before transplanting as per treatment. The sixteen treatments were evaluated in Factorial RBD design with three replications. The yield parameters studied were equatorial diameter, polar diameter, fresh weight of curd, volume of curd, yield kg/plot and q/ha. The statistical analysis of data in respect of the growth and yield components was done according to the standard procedure given for randomized block design by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

A. Effect of organic manures& its combination on yield attributes of cauliflower

The data presented in Table 1 indicates that treatment T_4 exhibited the highest values for polar and equatorial diameter of curd, fresh weight, volume of curd, yield kg/plot and q/ha with measurements of 11.60 cm, 14.55 cm, 593.08 g, 671.30 cm^3, 17.16 kg/plot and 295.84 q/ha, respectively. Treatments T_3, T_2, and T_1 followed closely followed in terms of these parameters. The observed notable enhancement in crop productivity when applying a combination of 50 per cent RDN through FYM and 50 percent RDN through vermicompost compared to the use of 100 percent RDN through FYM alone, might potentially be attributed to the accelerated breakdown and release of essential nutrients facilitated by vermicompost (Joshi *et al*., 2015; Chahal *et al*., 2019). The results of the current study are consistent with the findings reported by Jahan *et al*. (2014); Prabhakar *et al*. (2015); Devi *et al*. (2018) in the context of cauliflower.

B. Effect of panchagavya on yield attributes of cauliflower

Based on the findings presented in Table 2, it is evident that treatment T_4 exhibited the highest values for polar and equatorial diameter of curd, fresh weight, volume of curd, yield per plot and yield per hectare measuring 10.98 cm, 13.12 cm, 551.75 g, 626.66 cm^3, 15.77 kg/plot and 271.89 q/ha, respectively. These results were at par with treatment T_3. The elevated presence of bacteria, fungus and *actinomycetes* inside *panchagavya* may have led to an augmentation in the process of nutrient mineralization and solubilization. Consequently, this might have resulted in enhanced yield characteristics and overall crop output. Furthermore, it has been shown that *panchagavya* has a higher level of enzyme activity. In their study, Patel *et al*. (2018) examined the effects of *panchagavya* on plant growth and development. They found that *panchagavya* contains growth regulators such as auxins, gibberellins and cytokinins which stimulate the manufacture of cell growth regulators. As a result, *panchagavya* enhances plant growth and development, leading to improved yield. The use of foliar spray as a means of transporting nutrients and growth stimulants to plants has the potential to enhance output levels. The findings demonstrate a strong alignment with the outcomes reported by Sarkar *et al*. (2014) in their study on chilli, tomato and cowpea, as well as with the results obtained by Rakesh *et al*. (2017) in their investigation on okra and Pal and Bala (2020) in their research on cauliflower.

C. Interaction effect organic manures and panchagavya on yield attributes of cauliflower

The recorded data pertaining to the interaction impact of organic manures and *panchagavya* has been given in Table 3. Treatment T_{15} had the highest polar diameter of curd measuring 12.40 cm which was significantly maximum than other treatments and found at par with the treatments T_8, T_{11}, T_{12} and T_{16} with 11.47 cm, 11.70 cm, 11.97 cm, and 11.73 cm, respectively. Similarly, the volume of curd was seen to be considerably highest in treatment T_{16} measuring 727.27 cm^3. This value was found at par with treatments T_{14} (693.33 cm^3) and T_{15} (711.67 cm^3). In contrast, the equatorial diameter and fresh weight of the cauliflower curd were observed to be highest in treatment T_{16} measuring 15.30 cm and fresh weight 660 g, respectively. In terms of yield, treatment T_{16} had the highest production with 18.99 kg/plot and 327.38 q/ha.

Table 1: Effect of organic manures on yield attributes of cauliflower.

Treatment	Polar diameter of curd (cm)	Equatorial diameter of curd (cm)	Fresh weight of curd (g)	Volume of curd (cm^3)	Yield (kg/plot)	Yield (q/ha)
T_1	8.24	9.58	427.92	495.18	11.95	206.03
T_2	10.05	11.69	492.75	553.18	12.76	219.95
T_3	10.82	13.23	537.58	614.71	15.01	258.85
T_4	11.60	14.55	593.08	671.30	17.16	295.84
SEm±	**0.19**	**0.17**	**9.17**	**6.41**	**0.64**	**10.97**
CD (P=0.05)	**0.53**	**0.48**	**26.49**	**18.50**	**1.84**	**31.68**

T_1: Control, **T_2:** 100% RDN through FYM, **T_3:** 100% RDN through Vermicompost, **T_4:** 50% RDN through FYM + 50% RDN through Vermicompost

Table 2: Effect of *panchagavya* on yield attributes of cauliflower.

Treatment	Polar diameter of curd (cm)	Equatorial diameter of curd (cm)	Fresh weight of curd (g)	Volume of curd (cm^3)	Yield (kg/plot)	Yield (q/ha)
T_1	9.36	11.24	464.83	520.06	12.18	209.94
T_2	9.75	11.89	503.50	576.94	13.46	231.99
T_3	10.63	12.81	531.25	610.72	15.48	266.85
T_4	10.98	13.12	551.75	626.66	15.77	271.89
SEm±	**0.19**	**0.7**	**9.17**	**6.41**	**0.64**	**10.97**
CD (P=0.05)	**0.53**	**0.48**	**26.49**	**18.50**	**1.84**	**31.68**

T_1: 0 per cent (water spray) at 30 and 45 DAT, **T_2:** 3 per cent *Panchagavya* spray at 30 and 45 DAT, **T_3:** 5 per cent *Panchagavya* spray at 30 and 45 DAT, **T_4:** 10 per cent *Panchagavya* spray at 30 and 45 DAT

Table 3: Interaction effect of organic manures and *panchagavya* on yield attributes of cauliflower.

Treatment	Polar diameter of curd (cm)	Equatorial diameter of curd (cm)	Fresh weight of curd (g)	Volume of curd (cm^3)	Yield (kg/plot)	Yield (q/ha)
T_1	7.90	9.17	405.00	453.60	10.96	189.00
T_2	8.37	9.40	421.67	481.33	11.69	201.51
T_3	7.97	9.80	428.33	516.53	12.49	215.40
T_4	8.73	9.97	456.67	529.27	12.66	218.20
T_5	8.97	10.33	460.00	515.20	10.66	183.79
T_6	9.33	11.07	492.33	560.75	12.47	215.00
T_7	10.43	12.33	506.67	552.93	13.58	234.10
T_8	11.47	13.03	512.00	583.84	14.32	246.90
T_9	9.57	11.87	498.67	558.51	12.53	215.96
T_{10}	10.03	12.97	503.33	572.33	12.78	220.34
T_{11}	11.70	13.93	570.00	661.73	16.85	290.52
T_{12}	11.97	14.17	578.33	666.27	17.90	308.58
T_{13}	11.00	13.60	495.67	552.93	14.56	251.00
T_{14}	11.27	14.13	596.67	693.33	16.89	291.13
T_{15}	12.40	15.17	620.00	711.67	18.99	327.38
T_{16}	11.73	15.30	660.00	727.27	18.20	313.86
SEm±	**0.37**	**0.33**	**18.34**	**12.81**	**1.27**	**21.94**
CD (P=0.05)	**1.07**	**NS**	**NS**	**37.00**	**NS**	**NS**

T_1: Control, **T_2:**Control + 3 per cent P*anchagavya* spray at 30 and 45 DAT, **T_3:** Control + 5 per cent *Panchagavya* spray at 30 and 45 DAT, **T_4:** Control + 10 per cent *Panchagavya* spray at 30 and 45 DAT, **T_5:** 100 per cent RDN through FYM + Water spray, **T_6:** 100 per cent RDN through FYM + 3 per cent *Panchagavya* spray at 30 and 45 DAT, **T_7:** 100 per cent RDN through FYM + 5 per cent *Panchagavya* spray at 30 and 45 DAT, **T_8:** 100 per cent RDN through FYM + 10 per cent *Panchagavya* spray at 30 and 45 DAT, **T_9:** 100 per cent RDN through Vermicompost + Water spray, **T_{10}:** 100 per cent RDN through Vermicompost + 3 per cent *Panchagavya* spray at 30 and 45 DAT, **T_{11}:** 100 per cent RDN through VermiCompost + 5 per cent *Panchagavya* spray at 30 and 45 DAT, **T_{12}:** 100 per cent RDN through VermiCompost + 10 per cent *Panchagavya* spray at 30 and 45 DAT, **T_{13}:** 50 per cent RDN through FYM + 50 per cent RDN through Vermicompost + Water spray, **T_{14}:** 50 per cent RDN through FYM + 50 per cent RDN through Vermicompost + 3 per cent *Panchagavya* spray at 30 and 45 DAT, **T_{15}:** 50 per cent RDN through FYM + 50 per cent RDN through Vermicompost + 5 per cent *Panchagavya* spray at 30 and 45 DAT, **T_{16}:** 50 per cent RDN through FYM + 50 per cent RDN through Vermicompost + 10 per cent *Panchagavya* spray at 30 and 45 DAT.

CONCLUSIONS

Based on a comprehensive analysis of yield data, it can be concluded that the treatment of organic manures T_4, which involves the use of 50% RDN through FYM combined with 50% RDN through vermicompost, similarly *panchagavya* treatment T_4 application of 10 per cent *panchagavya* spray at 30 and 45 DAT mostly accountable for enhancing the various factors contributing to crop production.

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