

Original Research Article

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Influence of Panchagavya, Vermiwash and Organic Manure on Growth and Yield of Cauliflower (*Brassica oleracea L. var. botrytis*) cv. Pusa Snowball- 2

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The present investigation was carried out during winter season of 2018-19 at Experimental Farm, Department of Horticulture, Udai Pratap Autonomous College, Varanasi (U.P.) in Randomized Block Design with three replications. Different combinations of Panchgavya, Vermiwash and organic manure (FYM) with control were used as treatment. Observations were recorded on vegetative, reproductive and yield related parameters. On the basis of recorded observations, it is found that the performance of the T₅ (100% NPK through FYM @ 20 t/ha + foliar spray of Panchagavya @ 4%) was better in all growth parameters such as plant height (19.49, 31.20 and 39.23 cm), number of leaves per plant (9.37, 15.87 and 19.75), leaf area (220.35, 358.52 and 518.25 cm²), leaf length (12.50, 19.60 and 19.90 cm) and stem length (6.50, 8.89 and 10.78 cm), while the performance of T₆ [100% NPK through Vermiwash (1:5 times dilution) + foliar spray of Panchagavya @ 4%] was found significant influence on Days of curd initiation (63.69 days) and Days of curd maturity (74.09 days) at 30, 45 and 60 DAT. The values for the characters Diameter of curd (12.07 cm), Weight of curd (737.78 g), Curd yield per plot (11.77 kg), Curd yield per hectare (273.57 q) showed highly significant performance with T₆ [100% NPK through Vermiwash (1:5 times dilution) + foliar spray of Panchagavya @ 4%]. The treatment T₅ (100% NPK through FYM @ 20 t/ha + foliar spray of Panchagavya @ 4%) performed as the best combination for growth and T₆ [100% NPK through Vermiwash (1:5 times dilution) + foliar spray of Panchagavya @ 4%] for reproductive and yield characters for commercial production of cauliflower.

Introduction

Cauliflower (*Brassica oleracea L. var. botrytis*) is an herbaceous annual or biennial vegetable of the family Cruciferae grown for edible tender curds and it is one of the popular vegetable crop around the world with respect to area, production and its availability. It has diploid chromosome number of 2n=2x=18. Cauliflower is primarily grown for

consumption as a vegetable eaten after bowel or steaming or drying as pickling. India is a second leading cauliflower producing country after China. India rank second in area and production of cauliflower in the world after China. In India, Cauliflower is grown in an area of 0.453 million hectare with production of 8.668 million tonnes and productivity of 19.8 metric tonnes per hectare. In Uttar Pradesh, it is grown in an area of 14.39

thousand hectares with a production of 281.92 thousand tonnes per hectare (Anonymous, 2018). In the coming years the great challenges facing by the Nation is to provide safe food for the growing population in the country. In this regard, organic forming which is an eco-friendly and holistic production management system for promoting and enhancing the health of agro-ecosystem and ensure safe food for human consumption. Panchagavya has got reference in the scripts of Vedas (divine scripts of Indian wisdom) and Vrikshayurveda (Natarajan, 2002).

Panchagavya is reported to contain biofertilizers like *Azospirillum*, *Azotobacter*, Phosphobacteria, *Pseudomonas* and *Lactobacillus* (Yadav and Lourduraj, 2003). The essential plant nutrients from Panchagavya, Vermiwash and organic manure caused a tremendous influence on the growth, reproduction and yield of the crop.

Preparation of Panchagavya, Vermiwash and organic manure

Panchagavya is a pure organic formulation, in Sanskrit, means the mixed liquid of five by products obtained from cow such as cow dung, urine, curd, ghee and milk (all from cow). In India, use of Panchagavya in organic farming is gaining popularity in recent years especially in states like Tamil Nadu and Kerala. Panchagavya requires mainly five products of cow along with certain other ingredients as listed as Fresh cow dung- 7 kg; Cow urine- 3L; Cow milk- 2 L; Cow curd- 1 kg, Cow ghee- 1 kg; Sugarcane juice- 3 L or 500 g jaggery; Tender coconut water- 3 L; Ripened banana- 12 Nos.; 100 g yeast + 100 g jaggery dissolved in 2 L of warm water (Natarajan, 2002; Pathak, 2002). Firstly mixed the cow dung and ghee stirring along with ripe banana properly for 2-3 days carefully morning and evening three days after mixed all ingredients and stir carefully

two times in day for 21-25 days (Natarajan, 2002).

Vermiwash is a liquid that is obtained after the passage of water through a column of worm action. It is a collection of excretory products and mucous secretion of earthworms along with micronutrients from the soil organic molecules. All available litter and refuse is mixed with soil and spread in the shed of animal so as to absorb urine. The next morning, urine soaked refuse along with dung is collected and placed in the trench. Trench size is 6-7.5 m length, 1.5-2.0 m width and 1.0 m deep are dug. A section of the trench from one end should be taken up for filling with daily collection. When the section is filled up to a height of 45 to 60 cm above the ground level, the top of the heap is made into a dome and plastered with cow dung earth slurry. The manure is ready for use in about four to five month after plastering.

Materials and Methods

The experimental material for the present investigation was comprised of a standard variety Pusa Snowball-2 and treated with different combinations of Panchagavya, Vermiwash and organic manure at different interval and replicated thrice in Randomized Block Design. The experiment was carried out at Experimental Farm, Department of Horticulture, Udai Pratap College, Varanasi (U.P.), during Rabi season of 2018-19. The whole investigation was conducted under the scientific management practices. During study, observations for growth parameters such as Plant height (cm), Number of leaves per plant, Leaf length (cm), Leaf area (cm^2), Stem length (cm), reproductive parameters like Days to first curd appearance, Days to curd maturity and yield parameters such as Diameter of curd (cm) Weight of curd (g), Curd yield (Kg/plot) and Yield per hectare (q) were recorded on five randomly selected plants from each treatment.

The different treatments used are T_1 (100% NPK through FYM @ 20 t/ha), T_2 (100% NPK through Vermiwash (1:5 time dilution)), T_3 (100% NPK through FYM @ 20 t/ha + foliar spray of Panchagavya @ 2%), T_4 (100% NPK through Vermiwash (1:5 time dilution) + foliar spray of Panchagavya @ 2%), T_5 (100% NPK through FYM @ 20 t/ha + foliar spray of Panchagavya @ 4%), T_6 (100% NPK through Vermiwash (1:5 time dilution) + foliar spray of Panchagavya @ 4%), T_7 (Foliar spray of Panchagavya @ 4%), T_8 (100% NPK through FYM @ 20 t/ha + Vermiwash (1:5 time dilution)) and T_9 (Control). The data recorded from experiment for eleven characters in cauliflower cv. Pusa Snowball- 2 with different treatments was subjected to the following statistical analysis as per procedure described by Gomez and Gomez (1984). The significance of the treatments was tested through F-test at 5% and 2% level of significance. Whereas, the mean analysis was done after testing the significance of the variance ratio of error mean squares.

Results and Discussion

The application of Treatment T_5 (100% NPK through FYM @ 20 t/ha + foliar spray of Panchagavya @ 4%) was showed the maximum plant height showed in fig. 1 and table 1, number of leaves and leaf area significantly. The use of Panchagavya, Vermiwash with Organic Manure significantly improve the growth of cauliflower crop in comparison to chemical fertilizers alone. The leaf length was significantly increased with the application of Panchagavya, Vermiwash and Organic Manure.

The maximum leaf area was observed in Treatment T_5 (100% NPK through FYM @ 20 t/ha + foliar spray of Panchagavya @ 4%) during 2018-19 in Rabi season. Similar types of results are recorded in various crops likes

brinjal, chilli, chick pea, moringa okra etc. by various researchers like Velmurugan *et al.*, (2008), and Kanomozhi (2004).

The Panchagavya, Vermiwash and Organic Manure were showed very well effect on curd diameter, curd weight and yield of cauliflower respectively. The maximum curd diameter, curd weight and curd yield were reported and showed in figure 6, 7 and table 2 with the application of Treatment T_6 (100% NPK through Vermiwash (1:5 times dilution) + foliar spray of Panchagavya @ 4%). Simultaneous types of results are also found in different crops by various researchers like Lalitha *et al.*, (2000), Kanwar *et al.*, (2002), Velmurugan (2005), Gorge (2006) and Ali *et al.*, (2011).

Presence of macro (N, P, K and Ca) and micro (Zn, Fe, Cu and Mn) nutrients besides total reducing sugars (glucose) in Panchagavya. Chemolithotrops and autotrophic nitrifiers (ammonifiers and nitrifiers) present in Panchagavya which colonize in the leaves increased the ammonia uptake and enhance the total N supply Papen *et al.*, (2002), Swaminathan, *et al.*, (2007). The pH of Panchagavya was lowered to 4.52 at 30 days of fermentation and this might be due to *Lactobacillus* bacteria in Panchagavya, which produced more organic acids during fermentation (Mathivanan *et al.*, (2006)).

The use of Panchagavya, Vermiwash with Organic Manure significantly improve the growth of cauliflower crop in comparison to chemical fertilizers alone.

The result obtained by the use of FYM with Panchagavya are due to rapid cell division, multiplication and cell elongation in meristematic region of plant which promoted vegetative growth of plant in the form of plant height, number of leaves and leaf area (Fig.1-9).

Table.1 Effect of Panchagavya, Vermiwash and organic manure on growth, reproduction and yield

Treatments	Plant height (cm)			Number of leaves/plant			Stem length (cm)			Leaf length (cm)			Leaf area (cm ²)		
	30 DAT	45 DAT	60 DAT	30 DAT	45 DAT	60 DAT	30 DAT	45 DAT	60 DAT	30 DAT	45 DAT	60 DAT	30 DAT	45 DAT	60 DAT
T ₁	18.00	28.04	37.80	7.92	13.68	18.33	5.00	6.29	9.10	10.54	16.52	17.70	182.60	290.63	453.32
T ₂	17.10	26.98	35.79	6.53	12.26	16.57	4.90	6.33	9.22	9.98	18.11	18.77	151.47	258.41	410.44
T ₃	15.60	24.10	33.88	7.60	13.37	17.67	5.11	6.99	9.67	11.10	17.00	18.11	191.31	318.46	468.60
T ₄	17.70	27.59	36.00	7.21	12.82	17.37	5.43	6.75	8.97	12.12	18.28	18.79	173.30	295.44	437.09
T ₅	19.49	31.20	39.23	9.37	15.87	19.75	6.50	8.89	10.78	12.50	19.60	19.90	220.35	358.52	518.25
T ₆	18.73	29.98	37.45	8.73	15.30	19.29	6.12	8.48	10.21	11.76	17.57	17.99	210.60	345.68	501.57
T ₇	16.90	25.89	36.00	6.87	12.50	16.81	5.38	7.43	9.87	10.10	16.98	18.56	162.96	276.31	421.25
T ₈	18.10	29.00	37.95	8.20	14.31	18.64	5.99	7.22	9.98	11.83	17.00	18.11	201.43	332.19	481.84
T ₉	14.98	23.88	33.89	6.13	11.77	16.32	4.89	6.00	9.00	8.99	16.00	17.66	147.83	243.09	390.81
SEm ₊	0.22	0.24	0.29	0.28	0.19	0.22	0.13	0.10	0.21	0.33	0.42	0.44	2.12	2.64	4.01
CD (P=0.05)	0.69	0.73	0.90	0.86	0.58	0.68	0.42	0.78	0.61	0.15	0.21	0.13	6.42	7.98	12.14

Table.2 Effect of Panchagavya, Vermiwash and organic manure on reproduction and yield

Treatments	Curd diameter (cm)	Curd weight (g)	Curd Initiation (Days)	Curd Maturity (Days)	Yield/plot (kg)	Yield/ha (q)
T ₁	9.82	616.72	69.61	81.78	9.81	228.27
T ₂	8.71	582.60	68.19	79.29	9.36	215.47
T ₃	10.89	655.84	66.43	78.37	10.52	242.77
T ₄	10.38	635.73	65.74	77.74	10.27	235.28
T ₅	11.79	724.78	65.32	76.79	11.59	267.55
T ₆	12.07	737.31	63.69	74.09	11.77	273.57
T ₇	9.46	598.10	64.4	75.1	9.57	221.86
T ₈	11.27	699.63	67.36	79.25	11.35	259.87
T ₉	6.50	455.30	70.17	82.28	7.27	168.13
SEm ₊	0.27	1.74	0.83	1.40	0.37	1.48
CD (P=0.05)	0.82	5.27	2.51	4.24	1.13	4.50

Fig.1-8 Graphical representation of effect of Panchagavya, Vermiwash and organic manure on growth, reproductive and yield characters of cauliflower` vc. Pusa Snowball- 2

Fig.- 1

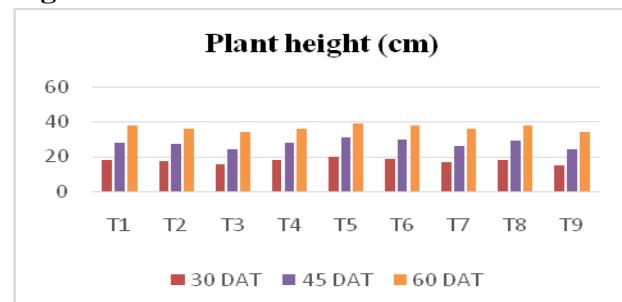


Fig.- 2

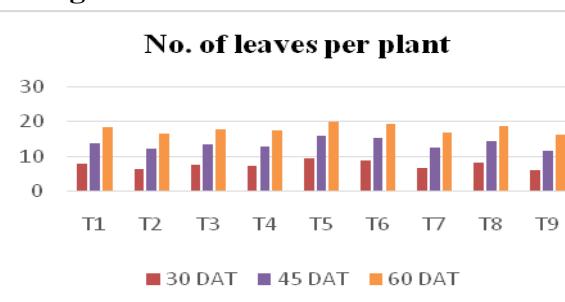


Fig.- 3

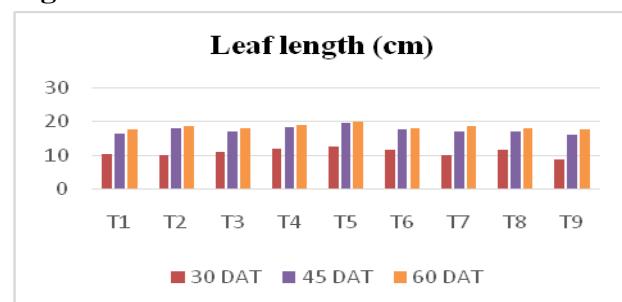


Fig.- 4

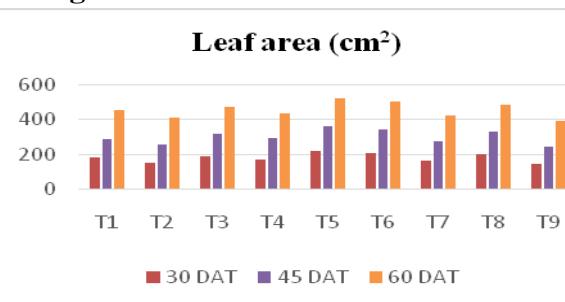


Fig.- 5

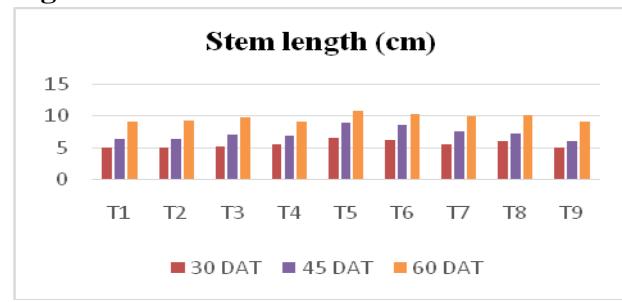


Fig.- 6

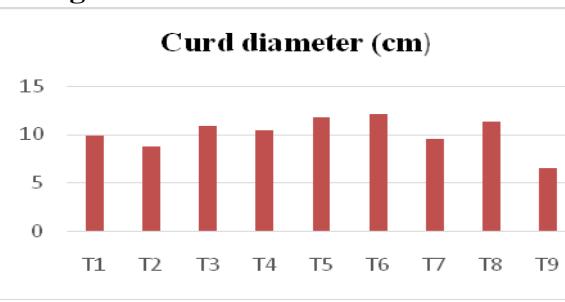
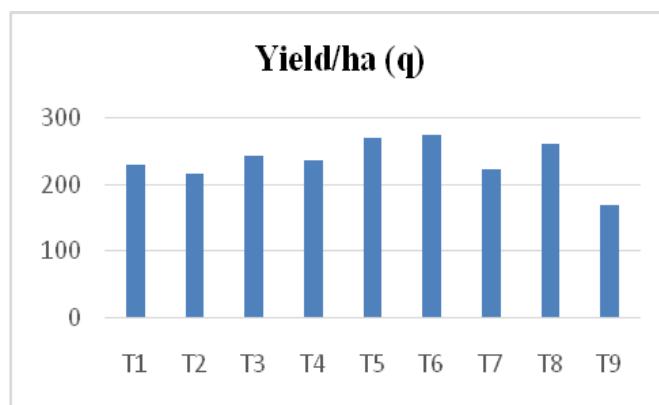


Fig.- 7

Fig.- 8

Fig.9



These products act as growth promoter and immunity booster. Panchagavya contains growth regularity substances that helps in the development of Integrated Pest Management (IPM) such as GA₃, IAA, Cytokinins, essential plant and organic farming nutrients and effective micro- organisms. This is done due to the production of plant growth substances by Panchagavya which stimulated the metabolic process of plants through the way of activation of desirable enzymes. The above results were enclosed in the findings of Srimathi, S. (2014) investigated the effect of organic nutrient and bio-regulators on growth and yield of cauliflower. Similar kinds of results were also observed by Anburani and Manivannan (2002), Velmurugan (2005), Sanjutha *et al.*, (2008),, Agarkare *et al.*, (2010), Ali *et al.*, (2011) and Gore and Sreenivasa (2011),

Thus, it could be concluded that there are ample variation exist among the different treatments under study which reflects the great opportunity for improving quality as well as quantity in different combinations of Panchagavya, Vermiwash and organic manure in cauliflower. Because of the vegetables produced organically, it fetch higher market price therefore, even if the yield is slightly less with pure organic inputs, it can be recommended for the commercial cauliflower production in view of healthy ecosystem and quality product instead of quantity.

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