



Effect of Panchagavya on Growth, Yield and Quality of Okra (*Abelmoschus esculentus* L.)

Dina Mandodi ^{a*φ}, Deepanshu ^{a#} and Vijay Bahadur ^{a†}

^a Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj 211007 (UP), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i2231405

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/90618>

Original Research Article

Received 03 June 2022
Accepted 09 August 2022
Published 10 August 2022

ABSTRACT

An experiment was conducted in the Horticulture Research farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) during *kharif* season. The experiment was laid out in RBD with 11 treatment with 3 Replications. The results revealed that Treatment T₈ (100% RDF + 3% Panchagavya) performed the best in terms of days to plant height (66.71 cm), Number of branches (5.25), Number of leaves (30.67), Days to 50% flowering (41.13), Length of capsule (8.17 cm), Width of capsule (1.91cm), Number of capsules per plant (19.53), Average fresh weight of capsule (13.80 g), capsule yield per plant (132.27 g), capsule yield per ha (135.20 q), Number of seed per capsule (56.33), Shelf life of fruit (5.73), Total soluble solids (3.03), Seed index (7.40), B:C Ratio (3.49). Therefore, the Treatment T₈ (100% RDF + 3% Panchagavya) is best when compared to other treatments. As the highest benefit cost ratio was observed in treatments T₈ (100% RDF + 3% Panchagavya) i.e., (3.49) which states that it is economically profitable compared to all other treatments.

Keywords: Okra; panchagavya; growth; yield and quality.

^φM.Sc. Research Scholar;

[#]Assistant Professor;

[†]Associate Professor;

*Corresponding author: E-mail: dinasajeev2016@gmail.com;

1. INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) also known as lady's finger or bhindi belongs to family Malvaceae having high chromosome number among vegetables ($2n=130$). It is native to Africa and grown in tropical and sub-tropical part of the world Singla et al. [1]. The composition of okra pods per 100 g edible portion (81% of the product as purchased, ends trimmed) is: water 88.6 g, energy 144.00 KJ (36 Kcal), protein 2.10 g, carbohydrate 8.20 g, fat 0.20 g, fibre 1.70 g, Ca 84.00 mg, P 90.00 mg, Fe 1.20 mg, β -carotene 185.00 mg, riboflavin 0.08 mg, thiamin 0.04 mg, niacin 0.60 mg, ascorbic acid 47.00 mg, the composition of okra leaves per 100g edible portion is: water 81.50 g, energy 235.00 KJ (56.00 Kcal), protein 4.40 g, fat 0.60 g, carbohydrate 11.30 g, fibre 2.10 g, Ca 532.00 mg, P 70.00 mg, Fe 0.70 mg, ascorbic acid 59.00 mg, β -carotene 385.00 mg, thiamin 0.25 mg, riboflavin 2.80 mg [2]. Carbohydrates are mainly present in the form of mucilage [3,4]. That of young fruits consists of long chain molecules with a molecular weight of about 170,000 made up of sugar units and amino acids. The main components are galactose (25%), rhamnose (22%), galacturonic acid (27%) and amino acids (11%). The mucilage is highly soluble in water. Its solution in water has an intrinsic viscosity value of about 30%.

Panchagavya is a Sanskrit word that means a blend of five products obtained from cow. The five products include cow dung + cow urine + cow milk + cow curd and cow ghee. All these are individually called "Gavya" and altogether called a "panchagavya". Kumar et al. [5]. Panchagavya is used in different means such as foliar spray, soil application along with irrigation water, seed or seedling treatment etc. Cow dung acts as a medium for the growth of beneficial microbes. Cow's urine provides nitrogen which is essential for the plant growth. Milk provides protein, fat, carbohydrate, amino acid and calcium. Curd provides lactobacillus which act as a catalyst in the digestion of organic wastes. Ghee provides vitamin A and B, calcium and fat [6]. Inadequate data was observed on application of Panchagavya on growth, yield and quality of okra. Therefore an experiment was conducted to determine the best concentration of Panchagavya on growth, yield and quality of okra.

2. MATERIALS AND METHODS

The experiment was conducted at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during 2021 during Kharif season.

The experiment material consisted of TMOH-346 variety of Okra. The experiment was laid out in randomized block design with three replications consisting of 11 treatments viz. T₀: 100% RDF (Control), T₁: 100% RDF + 1% Panchagavya, T₂: 100% RDF + 2% Panchagavya, T₃: 100% RDF + 3% Panchagavya, T₄: 100% RDF + 4% Panchagavya, T₅: 100% RDF + 5% Panchagavya were sprayed at weekly intervals from two true leaves in 3 times and T₆: 100% RDF + 1% Panchagavya, T₇: 100% RDF + 2% Panchagavya, T₈: 100% RDF + 3% Panchagavya, T₉: 100% RDF + 4% Panchagavya, T₁₀: 100% RDF + 5% Panchagavya were sprayed at weekly intervals from two true leaves in 5 times. The plot size was 1.5m x 1.5m with 50cm x 30cm spacing rows and plants. Five plants were randomly selected for recording observations on growth, Yield and quality attributing parameters.

3. RESULTS AND DISCUSSION

The application of 100% RDF + 3% panchagavya (T₈) was found beneficial in terms of plant height (cm), Number of branches, Number of leaves, Days to 50% flowering, length of capsule, width of capsule, Number of capsule per plant, Average fresh weight of capsule, capsule yield per plant, capsule yield per ha, Number of seed per capsule, Shelf life of fruit, Total soluble solids, Seed index.

3.1 Growth Parameters

The statistical data on growth parameters in different treatments was recorded (Table 1). In the experiment the results revealed that the maximum Plant height was found in T₈ (100% RDF + 3% panchagavya) which was 18.29, 26.39, 36.17 and 66.71 cm in 25, 35, 45 DAS and day at first harvest. The minimum plant height was found in T₀ (100% RDF) which was 14.25, 23.65, 33.18 and 61.70 cm in 25, 35, 45 and day at first harvest. The data indicated in Table 1 shows that the maximum Number of Branches was found in T₈ (100% RDF + 3% panchagavya).

which was 2.41, 3.67 and 5.25 in 35, 45 DAS and day at first harvest and the minimum number of branches was found in T₀ (100% RDF) which was 1.18, 2.22 and 3.30 in 35, 45 and day at first harvest. The maximum Number of Leaves was found in T₈ (100% RDF + 3% panchagavya) which was 9.60, 12.73, 21.20 and 30.67 in 25, 35, 45 DAS and day at first harvest and the minimum number of leaves was found in T₀ (100% RDF) which was 7.13, 11.40, 19.07 and 27.47 in 25, 35, 45 and day at first harvest. The minimum days to 50% flowering recorded followed by in T₈ (100% RDF + 3% panchagavya) (41.13) and the maximum in T₀ Control (49.07).

The foliar application of 3% panchagavya increased the plant height at all the observed stage of plant growth though no significant differences were recorded between treated and untreated plants. Swarnam et al. [7]. The increase in the number of branches per plant due to auxins, which is present in Panchagavya attributed to the activation of cell division and cell elongation in the auxiliary buds which had a promoting effect in increased number of branches. Similar results were found in Ram et al., (2015) & Mishra et al. [8]. Panchagavya provide nutrients continuously as well as growth hormones that increase number of leaf, leaf area as well as surface area which result in better plant growth and development. More leaves/plant is necessary for adequate availability and supply of nutrients balanced proportion, which ultimately resulted in triggering the production of plant growth hormones in combination with humic acid and other hormones in onion. Gopakali et al. [9]. Swain et al. [10] revealed that the Application of panchagavya has growth regulating effect along with insecticidal properties which must have triggered the formation of florigen resulting in early flowering. Similar results were found in the findings of Mishra et al. [8].

3.2 Yield Parameters

The statistical data on yield parameters in different treatments was recorded (Table 2) in the experiment the results revealed that the maximum length of capsule was found in T₈ (100% RDF + 3% panchagavya) which was (8.17 cm) and the minimum length of capsule

was found in T₀ (100% RDF) (7.79 cm). The data indicated in Table 2 shows that the maximum width of capsule was found in T₈ (100% RDF + 3% panchagavya) which was (1.91 cm) and the minimum width of capsule was found in T₀ (100% RDF) (1.41cm). The application of liquid organic manures along with inorganic fertilizer increases the maximum fruit length and diameter of the fruit this is due to the organically liquid manures are rich source of beneficial micro organism and contain growth promoting substances which might lead to increase fruit development characters. Jadav et al. [11]. The maximum number of fruit per plant was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (19.53) and the minimum number of fruit per plant was found in control (12.27). The maximum number of seed per fruit was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (56.33) and the minimum number of seed per fruit was found in control (39.33). This was might be due to quantities of IAA and GA present in Panchagavya could created stimuli in the plant system and increased the production of growth regulator in cell system and the action of growth regulators in plant system stimulated the necessary growth and development of crop. The present findings were in line with those of Patel et al. [12]. The maximum average fresh weight of fruit was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (13.80 g) and the minimum average fresh weight of fruit was found in T₀ control (10.47 g). The fresh weight of *Abelmoschus esculentus* in heighest were recorded in the plants sprayed with 3% concentration of Panchagavya when compared with control as well as other concentrations. Rakesh et al. [13]. The maximum pod yield per plant was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (132.27 g) and the minimum capsule yield per plant was found in control (115.33 g). The maximum capsule yield per ha was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (135.20q) and the minimum capsule yield per ha was found in control (65.21q). This might be due to hormonal effect of along with increase in photosynthetic activity of plants which causes better source-sink relationship in chilli. Similar results were obtained by Swain et al. [10].

Table 1. Effect of panchagavya on growth trait of okra

Treatments	Treatment combination	Plant height (cm)				Number of branches			Number of leaves				Days to 50% flowering
		25 DAS	35 DAS	45 DAS	Day at first harvest	35 DAS	45 DAS	Day at first harvest	25 DAS	35 DAS	45 DAS	Day at first harvest	
T ₀	Recommended dose of fertilizer	14.25	23.65	33.18	61.70	1.18	2.22	3.30	7.13	11.40	19.07	27.47	49.07
T ₁	100% RDF+ 3 sprays of 1% panchagavya	15.31	24.29	34.53	62.62	1.23	2.63	3.62	7.40	11.93	19.93	28.00	43.60
T ₂	100% RDF+ 3 sprays of 2% panchagavya	17.28	25.40	35.02	64.81	1.22	2.24	4.28	7.47	11.73	20.13	28.67	43.60
T ₃	100% RDF+ 3 sprays of 3% panchagavya	18.14	26.20	36.05	66.00	2.20	3.45	5.19	8.40	11.47	20.53	29.67	41.60
T ₄	100% RDF+ 3 sprays of 4% panchagavya	15.47	25.57	35.33	65.34	1.19	2.29	3.93	7.60	11.60	19.40	28.60	47.33
T ₅	100% RDF+ 3 sprays of 5% panchagavya	15.18	25.63	35.38	64.41	2.16	2.48	3.32	7.40	11.73	19.73	29.47	43.33
T ₆	100% RDF+ 5 sprays of 1% panchagavya	17.64	25.72	35.40	63.50	1.22	2.34	3.21	7.50	11.47	19.67	29.33	48.27
T ₇	100% RDF+ 5 sprays of 2% panchagavya	15.45	25.29	35.51	61.71	1.21	2.31	3.39	7.53	11.67	20.13	29.60	44.93
T ₈	100% RDF+ 5 sprays of 3% panchagavya	18.29	26.39	36.17	66.71	2.41	3.67	5.25	9.60	12.73	21.20	30.67	41.13
T ₉	100% RDF+ 5 sprays of 4% panchagavya	16.79	25.54	35.49	64.46	1.25	2.25	4.21	7.75	11.87	20.13	29.33	42.93
T ₁₀	100% RDF+ 5 sprays of 5% panchagavya	17.70	25.77	35.66	65.41	2.19	3.33	4.93	8.33	11.60	20.00	30.33	42.27
	F-Test	S	S	S	S	S	S	S	S	S	S	S	S
	S.E.d(±)	0.16	0.15	0.20	0.25	0.05	0.09	0.15	0.24	0.30	0.32	0.67	0.41
	C.D 0.05%	0.34	0.31	0.41	0.52	0.11	0.19	0.30	0.50	0.63	0.66	1.39	0.86
	cv	1.89	1.10	1.05	0.73	6.47	6.56	6.77	5.87	4.86	3.01	4.32	1.76

Table 2. Effect of panchagavya on yield and quality trait of okra

Treatments	Treatments	Length of capsule (cm)	width of capsule (cm)	Number of capsule per plant	Average fresh weight of capsule	capsule yield per plant (g)	capsule yield per ha (q/ha)	Number of seeds per capsule	Shelf life of fruit	TSS	Seed index	B:C Ratio
T ₀	Recommended dose of fertilizer	6.86	1.41	12.27	10.47	115.33	65.21	39.73	4.00	1.36	5.67	1.99
T ₁	100% RDF+ 3 sprays of 1% panchagavya	7.35	1.60	14.47	11.83	122.07	96.46	44.67	4.47	1.65	6.40	2.85
T ₂	100% RDF+ 3 sprays of 2% panchagavya	7.54	1.70	16.40	12.73	119.47	100.40	50.80	4.07	1.83	6.60	2.86
T ₃	100% RDF+ 3 sprays of 3% panchagavya	7.79	1.79	19.33	13.13	126.53	129.10	54.33	5.20	2.94	7.13	3.47
T ₄	100% RDF+ 3 sprays of 4% panchagavya	7.45	1.63	17.27	12.40	119.60	95.10	53.27	4.10	2.61	6.53	2.54
T ₅	100% RDF+ 3 sprays of 5% panchagavya	7.55	1.66	17.73	12.07	123.07	95.11	52.40	4.10	2.57	6.27	2.46
T ₆	100% RDF+ 5 sprays of 1% panchagavya	7.60	1.73	18.07	12.67	118.87	98.47	53.40	4.27	2.54	6.40	2.84
T ₇	100% RDF+ 5 sprays of 2% panchagavya	7.49	1.52	17.87	12.43	123.27	99.28	50.67	4.13	2.66	6.60	2.70
T ₈	100% RDF+ 5 sprays of 3% panchagavya	8.17	1.91	19.53	13.80	132.27	135.20	56.33	5.73	3.03	7.40	3.49
T ₉	100% RDF+ 5 sprays of 4% panchagavya	7.51	1.71	16.67	12.20	118.73	95.99	51.87	4.13	2.31	6.27	2.36
T ₁₀	100% RDF+ 5 sprays of 5% panchagavya	7.65	1.75	18.60	13.07	124.07	123.96	53.73	4.73	2.89	7.07	3.01
	F- Test	S	S	S	S	S	S	S	S	S	S	S
	S.E.d(±)	0.10	0.04	0.30	0.36	2.03	2.29	0.63	0.21	0.06	0.19	
	C.D 0.05%	0.21	0.09	0.62	0.76	4.23	4.79	1.31	0.43	0.12	0.39	
	cv	2.25	4.84	3.36	5.54	3.15	4.20	2.34	8.750.0	4.46	5.42	

3.3 Quality Parameters

The statistical data on quality parameters in different treatments was recorded (Table 2) in the experiment the results revealed that the maximum shelf life of fruit was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (5.73) and the minimum shelf life of fruit was found in control (4.00). The supplementation of Panchagavya through foliar spray recorded higher shelf life over control which could be attributed to higher amount of nutrients, microorganisms and plant growth promoters present in it Boraiah et al. [14]. Similar results were found in the findings of Praveen kumar et al. [15]. The maximum TSS was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (3.03) and the minimum TSS was found in control (1.36). This may be due to the higher potassium supply from Panchagavya, which paved way for the conversion of radiation energy to chemical energy in ascorbic acid synthesis and translocation of assimilated sugars from leaves to fruits that ultimately resulted in higher TSS [16-18]. These results are in close conformity with the findings of Jenny and Malliga [19]. The maximum seed index was increased significantly by the application of T₈ (100% RDF + 3% panchagavya) (3.03) and the minimum seed index was found in control (1.36). Patel et al. [12] showed that seed yield was significantly increased by 3% foliar spray of panchgavya.

4. CONCLUSION

The results from the present investigation concluded that T₈ which received 100% RDF+ 3% Panchagavya was found superior in plant height, number of branches per plant, number of leaves per plant, days to 50% flowering, length of capsule, width of capsule, number of capsules per plant, capsule yield per plant, average fresh weight of capsule, capsule yield per hectare, number of seed per capsule, shelf life of fruit, total soluble solids, seed index of okra net return of 289,686 Rs/ha with BC ratio of 3.49.

ACKNOWLEDGEMENTS

Success is the manifestation of diligence, perseverance, inspiration, motivation and innovations It is my proud and privilege to express a deep sense of gratitude to my advisor Mr. Deepanshu, Assistant Professor, Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj, to the chairperson

Dr. Sunil Zacharia, Assistant Professor, Department of Plant Pathology, SHUATS, Co advisor Dr. Vijay Bahadur Associate Professor and Head, Department of Horticulture, Naini Agricultural Institute, SHUATS, and member Dr. Anoorag R Tayde, Assistant Professor, Department of Entomology, SHUATS, and Dr. Bineetha M Bara Assistant Professor, Department of Plant Breeding and Genitics, SHUATS, for providing help in various ways and offering valuable suggestions during the course of the research work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Rajat Singla, Poonam Kumari, Thaneshwari. Evaluation of growth and yield parameters of okra (*Abelmoschus esculentus* L. Moench) Genotypes. International Journal of Pure and Applied Science. 2018;6(5):84-89.
2. Varmudy V. Making suvey Need to Boost Okra Exports. Department of Eco-nomics, Vivekananda College, Puttur, Karnataka; 2011.
3. Liu IM, Liou SS, Lan TW, Hsu FL, Cheng JT. Myricetin as the active principle of *Abelmoschus esculentus* to lower plasma glucosein streptozotocin- induced diabetic rat . *Planta Medica*. 2005;71:617-621.
4. Kumar R, Patil MB, Patil SR, Paschapur MS. Evaluation of *Abelmoschus esculentus* mucilage as suspending agent in paracetamol suspension. *Asion J. Agric. Res*. 2009;1:658-665.
5. Chunchu Suchith Kumar, Gurpreet Singh. Effect of Panchagavya on Growth and Yield: A Review. *The International Journal of Current Microbiology and Applied Sciences*. 2020;9. ISSN: 2319-7706.
6. Saritha MM, Vijayakumari B. Influence of selected organic manures on the seed germination and seedling growth of Clester bean (*Cyamopsis tetragonoloba* (L.) Taub). *Sciences, Technology and Arts Research Journal*; 2013.
7. Swarnam TP, Velmurugan A, Jaisankar I, Roy N. Effect of foliar application of panchagavya on yield and quality characteristics of eggplant

- (*Solanum melongena* L). The Advances in Life Sciences. 2016;5(7).
Print: ISSN: 2278-3849, 2636-2639.
8. Mishra N, Sahu GS, Mishra PP, Ray M. Effect of panchagavya on growth and yield of capsicum. The National Academy of Agricultural Science (NAAS). 2015;33(4).
 9. Pradeep, Gopakali, Sharanappa. Effect of organic farming practices on growth, yield, quality and economics of onion (*Allium cepa*) in dry zone of Karnataka. The Indian Journal of Agronomy. 2014;59(2):103-107.
 10. Swain SS, Sachu SG, Mishra N. Effect of Panchagavya on growth and yield of Chilli (*Capsicum annum* L.) cv Kuchinda Local. The Green Farming. 2015;6(2):338-340.
 11. Jadav SD, Shinde SJ, Deshmukh KD. Influence of biofertilizer, liquid organic manures along with RDF on growth and flowering of okra (*Abelmoschus esculentus* L. Moench). Journal of Pharmacognosy and Phytochemistry. 2021;10(1):303-306.
 12. Patel MM, Patel DM, Patel KM. Effect of panchagavya on growth and yield of Cowpea (*Vigna unguiculata* L.) WALP.). An International e-Journal. 2013;2(3):313-317.
 13. Rakesh S, Pooguzhali S, Saranya B, Suguna S, Jothibas K. Effect of Panchagavya on growth and yield *Abelmoschus esculentus* cv. Arka Anamika. The Journal of Current Microbiology and Applied Sciences. 2017; 6(9):3090-3097.
 14. Boraiah B, Devakumar N, Palanna KB. Yield and quality parameters of capsicum (*Capsicum annum* L. var.) as influenced by organic liquid formulations. International Journal of Pure and Applied Science. 2018;6(1):33-338.
 15. Praveen Kumar DA, Thontadarya RN, Pujar Udachappa U, Alloli TB. Onion growth, yield and quality parameters as influenced by panchagavya and other biofertilizers. The International Journal of Applied Agricultural & Horticultural Sciences. 2014;5(6).
 16. Krishna Rao MR, Sathish Kumar M, Neema Kumari Jha. Comparative yield analysis of Chilli (*Capsicum annum* L.) by application of vermicompost and panchagavya. The Journal of Chemical and Pharmaceutical Research. 2015;7(9): 319-323.
 17. Sharvan Kumar, Himanshu Trivedi, Rahul Sah, Verma AK, Atul Yadav. Effect of different bio-enhancers on growth & yield of cauliflower (*Brassica oleracea* L. Var. Botrytis). The Journal of Pharmacognosy and Phytochemistry. 2018;SP1:769-772.
 18. Vinnoli P, Catherine S, Alexander P. A Comparative study on the effect of organic fertilizer Panchagavya and vermicompost on the yield of *Abelmoschus esculentus* (Ladiesfinger). The International Journal of Advanced Research. 2018;6(2):1331-1336.
 19. Jenny S, Malliga P. Influence of organic manure on morphological and yield attributes of tomato (*Solanum lycopersicon* L.). International Journal of Innovative Research in Science and Engineering. 2016;2347-3207.

© 2022 Mandodi et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/90618>