"INFLUENCE OF PANCHGAVYA AND JEEVAMRIT ON GROWTH, YIELD AND QUALITY OF TOMATO (*Solanum lycopersicum* L.)"

ABSTRACT

The experiment was conducted on "Influence Of Panchgavya And Jeevamrit On Growth, Yield And Quality Of Tomato (*Solanum Lycopersicum* L.)" conducted during the period of October,2021 to March, 2022 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh). The experiment was planned in factorial randomized block design with three replications and nine treatments. The observations were recorded on various growth, flowering and yield contributing characters. Based on the results obtained from the present investigation, it is concluded that the interaction of panchgavya 4.5% and jeevamrit 10.5% that is treatment T8 was superior followed by the interaction of panchgavya 4.5% and jeevamrit 7.5% that is treatment T6 . In this investigation the T8 was found most suitable for cultivation and getting better yield per hectare of tomatoes and best returns in terms of economics of the crop with high net returns and Benefit cost ratio

INTRODUCTION

One of the most important vegetables in the world, tomato (Solanum lycopersicum L.) is a very popular plant species and belongs to the Solanaceae family with chromosome number 2n = 24 native to Peru. Tomato has great economic importance all over the world. Tomato ranks 7th position in worldwide production after maize, rice, wheat, potatoes, soybeans and cassava. The total worldwide production of tomato was around 170.8 million tons in 2017, which covers around 5.02 million hectares of farming area. China being the leading production hub of tomato in the world, which accounted for 31% of the total produce. Tomatoes are the major dietary source of potassium and antioxidants such as ascorbic acid, vitamin A, lycopene and Tocopherols, that has been linked to several health benefits for human.

Organically grown fruits, vegetables, spices, useful plants, medicinal plants, aromatic plants, etc. have a longer shelf life than products grown by traditional methods. Sustainable agriculture practices can effectively prevent the invasion of pesticides and toxins into the food chain and soil and water pollution. It is used in a combination of ecologically sound modern techniques. Organic farming, although not its orthodox version, may be acceptable to farmers **(Sreenivasa *et al., 2009;* Gamma, 2015 and Pathak and Ram, 2013).**

Along with this, vegetable cultivation using organic farming methods is attracting the attention of consumers and producers. Health-conscious urban consumer groups are even willing to pay a premium for organic vegetables. Benefiting from WTO agreements, demand for organically

grown vegetables and processed products is in high demand in Europe and other wealthy export markets.

Since cattle have played an important role in the field of agriculture since Vedic times, Panchgavya and Jeevamrit can not only reduce farmers sole dependence on synthetic fertilizers, pesticides and insecticides, but also improve the microflora in the soil. It contains millions of microorganisms that help restore the soil, thus bringing new life to the soil. Using naturally prepared liquids like Jeevamrit and Panchagavya improves plant growth, yield and quality. These liquid solutions are prepared from cow dung, urine, milk, cottage cheese, ghee, legume flour, and jaggery. They contain macronutrients, essential micronutrients, many vitamins, essential amino acids, growth-promoting factors such as IAA, GA, and beneficial microorganisms **(Palekar, 2006; Natarajan, 2007; Sreenivasa *et al., 2010)*.** Panchagavya and Jeevamrit are inexpensive, eco-friendly organic supplements made from cow products such as cow manure, urine, milk, curds and ghee. Panchagavya is a powerful plant growth promoter that improves the biological efficiency of crops. It is used to rejuvenate the soil, protect plants from disease, and enhance the nutritional value of fruits and vegetables. It is used for foliar spraying, soil spraying combined with irrigation water, seedling treatment, etc. Panchagavya is best suited for foliar application. Jivamrit promotes bioactivity in the soil and provides the nutrients needed for the harvest.

Formulation of panchgavya and jeevamrit:

Preparation of jeevamrit :-

It can be easily prepared by mixing of 20 kg fresh cow dung, 20liter fresh cow urine, 4 kg pulse flour and 1 kg jaggary in 200 liter of clean water and mix all the ingredients thoroughly in a barrel. For fermentation process, keep this solution for 5- 10 days. Three times a day, regularly stir the solution with the help of wooden stick. After fermentation process, Jeevamrit solution will ready to use in plants. The ready solution of Jeevamrit can be applied through either sprinkler, on the soil or with foliar application.

Preparation of Panchgavya :-

The procedure for the preparation of Panchagavya was outlined by Selvaraj (2006), that can be easily prepared by mixing of 7 kg of fresh cow dung, 10 litre of fresh cow urine, 3 liter of cow milk, 1 kg of desi ghee, 2 litre of curd, 3 litre of tender coconut water, 3 kg Jaggery, 10 liter fresh water and 12 number of well ripened banana. At first, mix fresh cow dung and ghee of desi cow in a plastic container and mix exhaustively two times a day and keep separate for 3 days. After 3 days, mix fresh cow urine and water in the mixture and kept aside for 15 days and stir in the morning and evening hours. After 15 days, add rest of the ingredients in the mixture in a barrel or drum and keep the solution for fermentation process. Panchgavya solution will ready in 30 days, spray the solution after sieving through a fine cloth.

MATERIAL AND METHODS

Experimental site

The present investigation "Influence Of Panchgavya And Jeevamrit On Growth, Yield And Quality Of Tomato (*Solanum Lycopersicum* L.)" was conducted during October,2021-March,2022 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh). All the facilities necessary for cultivation, including labour were made available in the department. Prayagraj is situated at an elevation of 78 meters above sea level at 25.87˚ North latitude and 81.15˚ E longitudes. This region has a sub-tropical climate prevailing in the South-East part of U.P. with both the extremes in temperature, i.e., the winter and the summer. In cold winters, the temperature sometimes is as low as 0˚C in December – January and very hot summer with temperature reaching up to 46˚C in the months of May and June. During winter, frosts and during summer, hot scorching winds are also not uncommon. The average rainfall is around 1013.4 (cm) with maximum concentration during July to September months with occasional showers in winters. The meteorological data for the experimental period collected from Meteorological Observatory at College of Forestry and Environment, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj.

List 1 : Treatment details

Treatment	Treatment details
T_0 (P_0+J_0)	RDF only
T_1 (P_1+J_0)	RDF + (2.5% Spray of Panchgavya)
T_2 (P_2+J_0)	RDF + (4.5% Spray of Panchgavya)
T_3 (P_0+J_1)	RDF + (7.5% spray of Jeevamrit)
T_4 (P_0+J_2)	RDF + (10.5% spray of Jeevamrit)
T_5 (P_1+J_1)	RDF + (2.5% Spray of Panchgavya+7.5% spray of Jeevamrit)
T_6 (P_2+J_2)	RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit)
T_7 (P_1+J_2)	RDF + (2.5% Spray of Panchgavya+10.5% spray of Jeevamrit)
T_8 (P_2+J_1)	RDF + (4.5% Spray of Panchgavya+7.5% spray of Jeevamrit)

* RDF (120kg : 100kg : 80kg per ha) is common in all the treatments

Table 1 Growth parameters:

Treatments	Plant height 30 days (cm)			Plant height 60 days (cm)			Plant height 90 days (cm)		
T_0 (P_0+J_0)	21.03			35.6			52.81		
T_1 (P_1+J_0)	28.21			44.03			62.93		
T_2 (P_2+J_0)	31.99			45.7			66.64		
T_3 (P_0+J_1)	26.13			40.92			58.74		
T_4 (P_0+J_2)	28.32			43.29			60		
T_5 (P_1+J_1)	29.16			45.02			64.19		
T_6 (P_2+J_2)	32.64			49.96			69.31		
T_7 (P_1+J_2)	30.4			46.4			66.07		
T_8 (P_2+J_1)	35.07			52.03			72.11		
F- TEST	S			S			S		
	A	B	A*B	A	B	A*B	A	B	A*B
SE.d(±)	0.45	0.45	0.78	0.41	0.41	0.71	0.43	0.43	0.75
C.D 0.05	1.36	1.36	2.35	1.23	1.23	2.14	1.31	1.31	2.27

Table 2 Earliness parameters:

Treatments	Days to first flowering			Days to 50% flowering			Days to first harvest		
T_0 (P_0+J_0)	57.26			61.33			97.94		
T_1 (P_1+J_0)	56.48			59.36			92.37		
T_2 (P_2+J_0)	48.87			52.55			90.56		
T_3 (P_0+J_1)	54.3			58.32			92.42		
T_4 (P_0+J_2)	51.6			54.85			92.37		
T_5 (P_1+J_1)	47.41			53.16			92.09		
T_6 (P_2+J_2)	45.5			51.43			84.56		
T_7 (P_1+J_2)	46.04			52.14			91.02		
T_8 (P_2+J_1)	43.17			49.06			83.65		
F- TEST	S			S			S		
	A	B	A*B	A	B	A*B	A	B	A*B
SE.d(±)	0.28	0.28	0.49	0.37	0.37	0.64	0.37	0.37	0.64
C.D 0.05	0.85	0.85	1.47	1.11	1.11	1.93	1.12	1.12	1.94

Table 3 Yield attributing characters:

Treatments	Polar diameter (cm)			Radial diameter (cm)		
T_0 (P_0+J_0)	3.06			4.11		
T_1 (P_1+J_0)	3.23			4.50		
T_2 (P_2+J_0)	3.76			5.16		
T_3 (P_0+J_1)	3.08			4.28		
T_4 (P_0+J_2)	3.15			4.40		
T_5 (P_1+J_1)	3.32			4.70		
T_6 (P_2+J_2)	3.85			5.29		
T_7 (P_1+J_2)	3.60			4.94		
T_8 (P_2+J_1)	3.91			5.9		
F- TEST	S			S		
	A	B	A*B	A	B	A*B
SE.d(±)	0.01	0.01	0.01	0.04	0.04	0.07
C.D 0.05	0.03	0.03	0.05	0.13	0.13	0.23

Table 4 Yield parameters:

Treatments	No. of fruits per plant			Fruit weight (g)			Fruit yield (q/ha)		
T_0 (P_0+J_0)	8.02			150.45			**413.4**		
T_1 (P_1+J_0)	9.66			156.47			**569.9**		
T_2 (P_2+J_0)	10.82			201.26			**782.3**		
T_3 (P_0+J_1)	8.79			152.18			**497.1**		
T_4 (P_0+J_2)	9.63			171.9			**594**		
T_5 (P_1+J_1)	9.73			172.68			**585.2**		
T_6 (P_2+J_2)	11.94			205.4			**859.2**		
T_7 (P_1+J_2)	9.8			181.75			**639.1**		
T_8 (P_2+J_1)	12.53			211.96			**935.5**		
F- TEST	S			S			S		
	A	B	A*B	A	B	A*B	A	B	A*B
SE.d(±)	0.15	0.15	0.25	1.72	1.72	2.98	1.35	1.35	2.33
C.D 0.05	0.44	0.44	0.77	5.17	5.17	8.95	4.04	4.04	7.01

Table 5 Quality parameters:

Treatments	T.S.S (°BRIX)		
T_0 (P_0+J_0)	4.84		
T_1 (P_1+J_0)	4.97		
T_2 (P_2+J_0)	5.48		
T_3 (P_0+J_1)	4.89		
T_4 (P_0+J_2)	4.93		
T_5 (P_1+J_1)	5.17		
T_6 (P_2+J_2)	5.58		
T_7 (P_1+J_2)	5.33		
T_8 (P_2+J_1)	5.77		
F- TEST	S		
	A	B	A*B
SE.d(±)	0.02	0.02	0.04
C.D 0.05	0.07	0.07	0.12

Results and discussion:

Growth parameters:

The maximum plant height at 30 days (cm) was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 35.06 cm, while the minimum plant height at 30 days (cm) was recorded in T_0 (Control) in 21.02cm. The maximum plant height at 60 days (cm) was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 52.03 cm, while the minimum plant height at 60 days (cm) was recorded in T_0 (Control) in 35.59 cm. The maximum plant height at 90 days (cm) was

recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 72.1 cm,), while the minimum plant height at 90 days (cm) was recorded in T_0 (Control) in 52.80 cm. The plant height was significantly increased with the combine application of Panchgavya and RDF. This may be due to the ample supply of essential nutrients for crops that assist to enhance the nitrogen metabolism, auxin content, photosynthetic activity and chlorophyll content in plant tissue. Similar results were observed by **Arivazhagan *et.al* (2019).**

Earliness parameters:

The earliest flower was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 43.16 days**,**), while the last flower was recorded in T_0 (Control) in 57.26 days. Early flowering may be due to integration effect of panchgavya and jeevamrit which contains soil microbes, cynobacteria, PSB and growth hormones such as auxin, gibberalline, and cytokinins all of which influence and enhance nitrogen efficiency a way that chemical fertilizers do not.The appropriate integration of panchgavya and jeevamrit with inorganic fertilizer is capable of providing an optimal level of nutrients triggering early blooming in the treatment. Similar results were observed by **Robin *et al* (2021).**

The earliest 50% flowering was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 49.06 days, while the last 50% flowering was recorded in T_0 (Control) in 61.33 days. The earliest harvest was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 83.64 days, while the last harvest was recorded in T_0 (Control) in 97.93 days. The presence of growth regulators due to application of panchagavya and jeevamrit may be the reason for the early days to 50% flowering. Similar results were observed by **Robin *et al* (2021).**

Yield attributing characters:

The maximum polar diameter was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 3.91 cm, while the minimum polar diameter was recorded in T_0 (Control) in 3.06cm. The maximum radial diameter was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 5.9 cm, while the minimum radial diameter was recorded in T_0 (Control) in 4.11cm. Phytohormonal effect

attributed with the application of jeevamrit and panchagavya may be the reason for the higher radial diameter of the fruit in tomato. Similar results were observed by **Robin *et al*. (2020)**

Yield parameters:

The maximum number of fruits per plant were recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 12.53, while the minimum number of fruits per plant were recorded in T_0 (Control) in 8.02. The maximum fruit weight was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 211.96gm, while the minimum fruit weight was recorded in T_0 (Control) in 150.43gm. The presence of macronutrients, essential micronutrients, numerous vitamins, essential amino acids, growth-promoting substances like IAA, GA, and beneficial microorganisms in the liquid organic manures (panchagavya and jeevamrutha) may have improved the source-sink relationship, which may have contributed to the increase in fruit production. Similar results were observed by **Nileema *et al.* (2010)** The maximum yield per hectare was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 935.5q/ha, while the minimum yield per hectare was recorded in T_0 (Control) in 413.4q/ha. The stimulation of root growth due to the soil application of jeeamrit and panchagavya which was helpful in better absorption of water and nutrients from the soil and this may be the reason behind the better yield. Similar results were observed by **Sanjiv *et al* (2019).**

Quality parameters:

The maximum TSS was recorded in T_8 treatment that received RDF + (4.5% Spray of Panchgavya+10.5% spray of Jeevamrit) as 5.77°Brix, while the minimum TSS was recorded in T_0 (Control) in 4.84°Brix. TSS means the amount of Total Soluble Solids present in fruits. It means the sugar content in fruits and includes carbohydrates, proteins, fats, minerals and organic acid of the fruit. Higher TSS value means higher number of soluble solids present in fruits. It showed TSS becomes high with the combine application of both Jeevamrit and panchgavya compared to sole application of both the liquid bio-manures. Similar results were observed by **Kachave (2019).**

Economics:

Economically best treatment was T_8, gave the highest net return up to income of 563900.00 Rs./ha as well as BC ratio of 6.84.

Conclusion:

The result from the present investigation concluded that the treatment T_8 which received RDF+ 4.5% spray of Panchagavya + 10.5% spray of Jeevamrit was found superior in plant height, days to first flowering, days to 50% flowering, days to first harvest, polar and radial diameter, No. of fruits/plant, fruit weight (gm), fruit yield (q/ha), T.S.S content of tomato with high net income and BC ratio

REFERENCES:

Ali, M. N., Ghatak, S. and Ragul, T. (2011). Biochemical analysis of panchgvya and sanjibani and their effect on crop yield and soil health.*Journal of crop and weed.*, 7(2):84-86.

Ashok, pal., and Shashi, Bala., (2020) Influences of panchagavya, Vermiwash and organic manure on growth and yield of cauliflower (Brassica oleracea L. botrytis) cv. Pusa Snowball-2.The *International Journal Current Microbiology and Applied Sciences* ISSN:2319-7706 Volume 9 November 8 (2020).

Basavaraj Kumbar; Devakumar, N.; Sheshadri, T. (2016). Influence of farm yard manure, jeevamrutha and panchagavya on growth and yield of french bean (Phaseolus vulgaris L.) Department of Agronomy, College of Agriculture, UAS, GKVK, Bengaluru 560 065, India. *Mysore Journal of Agricultural Sciences* 2016 Vol.50 No.2 pp.279-283 ref.12

Bhargavi Y, Sudhakar P, Rajeswari VR and Krishna TG (2020) Influence of natural liquid organics on growth and biochemical attributes of blackgram (Vigna mungo L.) Journal of Pharmacognosy and Phytochemistry 2021; 10(1): 759-767

Boraiah,B., Devakumar,N. and Palanna, K.B.(2018) Yield and Quality Parameters of Capsicum (Capsicum annuum L. var.) as Influenced by Organic Liquid Formulations. *International Journal of Pure and Applied Science* **6** (1):33-338.

Jadav, S.D., Shinde , S.J., and Deshmukh, K.D. (2021) 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

Jain, P., Sharma, R. C., Bhattacharyya, P. and Banik, P. (2014). Effect of organic supplement (panchgavya) on seed germination and soil quality. *Environment Monit Assess* **186**: 1999-2011.

Gore,N. and Shreenivasa,M.N.(2011). Influence of liquid organic manures on growth, nutrient content and yield of tomato. *Karanatak J. Agric.Sci*., **24**(2):153-157.

Gowthamchand, N.J., Ganapathi and Soumya, T.M. (2020) Effect of organic manure and Fermented Liquid Organics on Growth, Yield, Nutrient Uptake and Economics of French Bean (Phaseolus vulgaris L) Under Rainfed Condition. *International Journal.*

NILEEMA S. GORE AND M. N. SREENIVASA (2010) Influence of liquid organic manures on growth, nutrient content and yield of tomato (Lycopersicon esculentum Mill.) in the sterilized soil. *Karnataka J. Agric. Sci.*,24 (2) : (153-157) 2011.

Phatak,R.K. and Ram,R.A. (2013). Bio-enhancers:A potential tool to improve soil fertility,plant health in organic production of horticultural crops. *Progressive Horticulture*,45(2):237-254.

Natarajan,K.(2007). Panchgavya for plant protection. *Proc.Nation.Conf.Glory Gomatha*,Dec.1-3,S.V.Veterinary University.,Tirupati,pp.72-75.

Raghavendra,K. V., Gowthami, R., Shashank, R. and Kumar, S.H.(2014).Panchgavya in organic crop production.*Popular kheti.*,**2**(2):233-236.

Rao, M. R., Kumar, M. S., and Jha, N. K. (2015). Comparitive yield analysis of chilli by application of vermicompost and panchgavya.*Journal of Chemical and Pharmaceutical Research.*,**7**(9):319-323.

Robin Rijal, Adesh Kumar*, Priyanka Maity, Siddhant Kumar Bisoyi, Subrata Chattarjee And Rakesh Nelli (2021). EFFECT OF BIO-MANURES ON GROWTH AND DEVELOPMENT OF TOMATO (Solanum lycopersicum L.*) Plant Cell Biotechnology and Molecular Biology 22(13&14):119-135; 2021*

Sahare, D. and Babalad, H. B. (2016). Effect of organic nutrient management practices on yield and nutrient uptake of aerobic rice. *InternationalJournal of Agriculture Science*, **12**(1):95-100.

Sanjiv Yadav, Amit Kanawjia, Rajkumar Chaurasiya, (2019) Response of bio-enhancer on growth and yield of tomato [Solanum lycopersicum (L.) Mill] *International Journal of Chemical Studies* 2019; 7(3): 180-184.

Selvaraj N. Organic Horticulture: Creating a More Sustainable Farming. Horticultural Research Station, Tamil Nadu Agricultural University; 2006.

Sharvan Kumar, Himanshu Trivedi, Rahul Sah, Verma A.K and Atul Yadav (2018) 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.

Sutar Reshma, Sujith G.M.*, Devakumar N. (2019) Growth and yield of Cowpea [Vigna unguiculata (L.) Walp] as influenced by jeevamrutha and panchagavya application *Legume Research - An International Journal* Year: 2019, Volume: 42, Issue: 6

Swarnam, T.P., Velmurugan, A., Jaisankar, I., and Roy, N. (2016) Effect of Foliar Application of Panchagavya on Yield and QualityCharacteristics of Eggplant (Solanum melongena L). *The Advances in Life Sciences* **5**(7), print : ISSN 2278-3849, 2636-2639.

Vimalendran, L. and Wahab, K. (2013). Effect of foliar spray of panchgavya on yield attributes,yield and economics of babycorn, *Journal of Agronomy.,* **12**(2): 109-112.

Yadav, P. And Tripathi, A. K. (2013). Growth and yield of greengram under foliar application of panchagvya and leaf extracts of endemic plants. *International Research Journal of Agronomy.*, **58**(4):618-621.