Review Article

"Effect of Panchagavya on Growth, Yield and Quality of Tomato (*Lycopersicon esculentum* L.)".

ABSTRACT

An experiment was conducted to determine the "Effectof Panchagavyaon growth, yield and quality of tomato (*Lycopersicon esculentum* L.)"atHorticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj (Uttar Pradesh)during *Kharif* season 2021. Total 12 treatments and 3 Hybrids were replicated thrice in a factorial randomized block design (FRBD). Hybrids are TMTH-234,TMTH-2267 andTMTH-288. These hybridswere treated with differentconcentrations of Panchagavya (1%, 2%, 3%) and control (water spray) were sprayed at 15, 30, 45 days after transplanting. The application of Panchagavya significantly affects the vegetative as well as reproductive attributes of the crop. The results showed that hybrid TMTH-2267 with 3% spray of Panchagavyaperformed best in terms of plant height (78.14 cm), days to 50% flowering (71.10), days to first harvest (98.10), polar diameter (5.47 cm), radial diameter (6.90 cm), number of fruits per plant (24), fruit weight (280.08 g), fruit yield per plant (1.68 kg), yield per hectare (55.88 t) and TSS (5.83 ^{0}Brix).

Key words: *Growth, Panchagavya, Tomato, Yield, Quality.*

1. Introduction:

Tomato is the edible berry of the plant (*Lycopersicon esculentum* L.),commonly known as a tomato plant. The species originated in western South America and Central America. It belongs to the Solanaceae family.Tomato is one of the important vegetable crops grownthroughout the world and ranks next to potatotomatoes widely grown in temperate climates across the world.**Buckseth[3](2012)** The red color of tomatoes is due to lycopene. The chromosome number is 2n=24. Tomatoes are a significant source of Umami flavor.The tomatoes are now grown and eaten around the world it is used in diverse ways including the raw in salads or slices, incorporated into a wide variety of dishes, processed into ketchup or tomato soup and unripen green tomatoes can also be breaded and fried used to make salsa or pickle.Tomatoes are rich sources of folate, vitamin C minerals like calcium phosphorus and potassium.relative to phytonutrients,**Dhaliwal[4](2003)**the most abundant in tomatoes are the carotenoids.lycopene is the most prominent carotenoids followed by beta carotene, gamma-carotene and phytoene as well as several minor carotenoids several minor carotenoids. Tomato juice has grown in popularity as an appetizer and beverage. Water (94.1%), energy (23 calories), calcium (1.0 g), magnesium (7.0 mg), vitamin A (1000 IU), ascorbic acid (22 mg), thiamine (0.09 mg), riboflavin (0.03 mg), and niacin (0.8 mg) are all present in a well-ripened tomato (per 100 g of wholesome meal)**Uddain[13](2009)**

Panchagavya: -TheSanskrit wordPanchagavya means “five cow derivatives”.when used in Ayurvedic medicine it is also called Cowpathy.Panchagavya or punchaKaviyam is a mixture used in traditional Hindu rituals that is prepared by mixing five ingredients.the three Direct constituents are cow dung,urine and milk; those two derived products are curd and ghee. Addition to this we can add jaggary, coconut water, sugarcane juice, Banana. **Somasundarum[11](2003).**

Preparation of Panchagavya: In the initial phase of making Panchagavya, take 5 kg of cow dung and 500 g of cow ghee. Pour the mixture into a mud pot, stir it twice daily for three days, and then store it. Next add 5 Liters of cow urine and 5 Liters of water then stir the mixture twice a dayfor two weeks (morning and evening). Then add 1 L of cow milk, 1 L of curd, 1.5 L of coconut water, 1.5 KG of jaggery, and 6 ripe bananas after the two weeks have passed. Make sure to make a paste of ripening bananas, then set it aside for a month by stirring it three times per day.Chemical composition consists of pH-5.45, Total N(ppm)-229, Total P(ppm)-209, Total K(ppm)-232, Sodium-90, Calcium-25, IAA-8.5 and GA (ppm)-3.5. The biological effectiveness of agricultural plants, as well as the quality and quantity of fruits and vegetables, are improved by Panchagavya. It also contains growth hormones including auxins and gibberellins, which are beneficial to crops and function as a tonic to improve soil quality, enhance crop growth and yield, and incite plant vigour with high-quality output.

2. Materials and methods:

The field experiment was conducted at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology AndSciences, Prayagraj (U.P)during *Kharif* season 2021. The University is about 7 km away from Prayagraj city and it is geographically situated at 25.5^0North latitude, 81.08^0E longitudes. The altitude of this location is about 98 meter above the mean sea level.

The experiment was laid out in Factorial Randomized Block Design (FRBD) with 12 treatments and 3 replications *viz.*,T_0:V_1P_0(TMTH-234 + Control), T_1: V_1P_1 (TMTH-234 + 1% spray of Panchagavya), T_2: V_1P_2(TMTH-234 + 2% spray of Panchagavya), T_3: V_1P_3 (TMTH-234 + 3% spray of Panchagavya),T_4: V_2P_0(TMTH-2267 + Control), T_5: V_2P_1(TMTH-2267 + 1% spray of Panchagavya), T_6: V_2P_2(TMTH-2267+ 2% spray of Panchagavya), T_7: V_2P_3(TMTH-2267+ 3% spray of Panchagavya), T_8: V_3P_0(TMTH-288+ Control), T_9: V_3P_1 (TMTH-288+ 1% spray of Panchagavya), T_{10}: V_3P_2(TMTH-288+ 2% spray of Panchagavya), T_{11}: V_3P_3 (TMTH-288+ 3% spray of Panchagavya) were sprayed at 15, 30, 45 days after transplanting.Tomato hybrids, TMTH-234, TMTH-2267and TMTH-288 these three hybrids were used in the experiment. The plot size was 2.6m x 2.4m with a spacing of 60cm x 45cm rows and plants. The Panchagavya solution was prepared from their respectivesolutions and ingredients. 1% includes 10 ml of Panchagavya solution in 1 liter of water. 2% includes 20 ml of Panchagavya solution in 1 liter of water. 3% includes 30 ml of Panchagavya solution in 1 liter of water. Three plants were randomly selected for recording observations on growth, yield and quality attributing parameters.

3. Results and Discussion:

3.1 Growth Parameters

Thestatistical data on growth parameters in different treatments was recorded (Table 1). In the experiment the results revealed that the plant height was increased significantly with the application of Panchagavya. TMTH-2267 + 3% spray of Panchagavya was recorded with maximumplant height (78.14 cm) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (77.08cm) whereas the minimum plant height was recorded in TMTH-234 + control (60.32 cm).The growth in plants may be attributed to the Panchagavyaspray.**Ruban. S [9]*et al., (*2019)** who reported that plant height significantly increased with application of Panchagavya and chemical analysisrevealed that Panchagavya possess almost all macro, micronutrients and growth promoting hormones (IAA, GA) required for plant growth.The data indicated in Table 1 show that application of Panchagavya significantly reduces days to 50% flowering which was recorded in TMTH-2267 + 3% spray of Panchagavya with minimum days for 50% flowering (71.10) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (71.77) whereas the maximum days for 50% flowering was recorded in TMTH-234 + control (81.16).Days taken for 50% flowering was significantly influenced by various treatments. Earliest flowering was observed with foliar application of

Panchagavya (3%) alone. Readily available N, P, K and growth regulators in Panchagavya may have induced early flowering in tomato. Similar findings were recorded by **Saraswathi. T** and **Praneetha. S [10] (2013).**

3.2 Yield Parameters

In this study the applicationof Panchagavya at regular intervals after transplanting shows significant difference on yield parameters as compared to control which was shown in Table 1. The results obtained in present study shows that application of Panchagavya significantly reduces days to first harvest which was recorded in TMTH-2267 + 3% spray of Panchagavya (98.10) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (102.29) whereas the maximum days to first harvest was recorded in TMTH-234 + control (110.16). Using Panchagavya helps to decrease the days to harvest and increase more yield and quality. Similar findings were seen in **Bharadwaj [2] (2021**) as compared to esculents were increased in 3% Panchagavya spray when compared with control and other concentration. Readily available N, P, K and growth regulators in Panchagavya has resulted for this. Maximum polar diameter was recorded in TMTH-2267 + 3% spray of Panchagavya (5.47 cm) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (5.35 cm) whereas the minimum polar diameter was recorded in TMTH-234 + control(4.00 cm).The application of Panchagavya increased the fruit diameter by increasing the cell division and enlargement of cell and resulted in more development and diameter of fruits It boosts photosynthetic activities and makes them more efficient for translocation and use of photo-synthetics that could be useful for the plant's growing section or growth stimulant.**Gopakkali[6] (2014).**Maximum radial diameter was recorded in TMTH-2267 + 3% spray of Panchagavya (6.90 cm) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (6.62 cm) whereas the minimum radial diameter was recorded in TMTH-234 + control(4.93 cm).Fruit circumference was high in Panchagavya treatment. This may be due to the growth promoting effect of Panchagavya which leads to increasing the diameter of fruit **S. Nandakumar [8](2021).**Maximum number of fruits was recorded in TMTH-2267 + 3% spray of Panchagavya (24.00) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (23.73) whereas the minimum number of fruits was recorded in TMTH-234 + control (21.22).The number of fruits was higher in the treatments with 3% spray of Panchagavya, which may be due to increased supply of major plant nutrients and are required in larger quantities for growth and development of plants. The increased nutrient availability from the organic manures might have increased the various endogenous hormonal levels in the plant tissue, which might be responsible for enhanced pollen germination and pollen tube growth, which ultimately increased the number of fruits per plant, resulting in higher yields. This is in line with the findings of **Jenny and Malliga[7](2016)** in tomato**, Bade[1](2017)** in chilli.Maximum fruit weight was recorded in TMTH-2267 + 3% spray of Panchagavya (280.08 g)

followed by TMTH-288 + 3% spray of Panchagavya was recorded with (264.59 g) whereas the minimum fruit weight was recorded in TMTH-234 + control(186.73 g).Taller plants with a greater number of branches have increased photosynthetic area, favorable physiological activities might have resulted in more production and translocation of photosynthates which in turn accelerated the formation of more fruits with larger size and with weight ultimately leading to higher fruit yield Soluble forms of nutrients are easily available in Panchagavya and makes the plant physiologically more active, which influences fruit weight positively. **Gajjela[5](2019)**Maximum fruit yield per plant was recorded in TMTH-2267 + 3% spray of Panchagavya (1.68 kg) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (1.58 kg) whereas the minimum fruit yield per plant was recorded in TMTH-234 + control(1.12 kg).Maximum fruit yield per hectare was recorded inTMTH-2267 + 3% spray of Panchagavya (55.88 t) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (52.77 t) whereas the minimum fruit yield per hectare was recorded in TMTH-234 + control (37.22 t).The increased fruit yield might also be due to increased photosynthetic efficiency resulting in higher accumulation of photosynthates as evidenced from significantly higher concentration of chlorophyll (a, b and total) content in Panchagavya treated plants. Findings are from **Swarnam[12]*et al.*, (2016)**.

3.2 Quality Parameters

In the study the applicationof Panchagavya at regular intervals after transplanting shows significant difference on quality parameters as compared to control which was shown in Table 1. The results obtained in present study shows that maximum TSS was recorded in TMTH-2267 + 3% spray of Panchagavya (5.83 ^{0}Brix) followed by TMTH-288 + 3% spray of Panchagavya was recorded with (5.77 ^{0}Brix) whereas the minimum TSS was recorded in TMTH-234 + control (4.91 ^{0}Brix).This may be due to the higher potassium supply from Panchagavya, which paved way for the conversion of radiation energy to chemical energy in translocation of assimilated sugars from leaves to fruits that ultimately resulted in higher TSS. These results are in close conformity with the findings of **Jenny and Malliga[7](2016).**

Conclusion: Based on the results of the present investigation entitled "Effect of Panchagavya on growth, yield and fruit quality of tomato (*Lycopersicon esculentum* L.)" in Prayagraj. Treatment consisted of Hybrid TMTH-2267 along with 3% spray of Panchagavya was recorded maximum performances with respect to almost all the characters *viz*., Plant height at 90 days after transplanting, days to 50% flowering, days to first harvest, Polar diameter, Radial diameter, Number of fruits, Fruit weight, Fruit yield/plant, yield/ha, Total Soluble Solids.

Acknowledgement: The work was supported by my Advisor Mr. Deepanshu and all faculty members, Department of Horticulture, Naini Agricultural institute, Sam Higginbottom University of

Agriculture, Technology And Sciences, Prayagraj, (U.P.) India for providing field and assistance in conducting the research trail.

Table 1: Effect of Panchagavya on growth, yield and quality parameters of tomato.

Treatment	Plant height at 90 DAT (cm)	Days to 50% Flowering	Days to first harvest	Polar diameter (cm)	Radial diameter (cm)	Number of fruits	Fruit weight (g)	Fruit yield per plant (kg)	Fruit yield per hectare (t)	TSS (^{0}Brix)
V_1 x P_0	60.32	81.16	110.16	4.00	4.93	21.22	186.73	1.12	37.22	4.91
V_1 x P_1	71.75	78.22	105.11	4.71	5.52	22.10	216.51	1.29	43.10	5.15
V_1 x P_2	73.54	75.44	104.11	5.11	6.08	22.55	227.43	1.33	44.22	5.26
V_1 x P_3	76.08	72.88	102.88	5.28	6.36	23.44	243.81	1.46	48.55	5.54
V_2 x P_0	71.36	80.11	107.04	4.52	5.51	22.00	206.33	1.23	41.10	5.06
V_2 x P_1	73.42	76.22	104.50	4.84	5.93	22.44	226.41	1.35	45.11	5.25
V_2 x P_2	74.54	73.88	103.55	5.18	6.28	23.00	237.93	1.42	47.44	5.38
V_2 x P_3	78.14	71.10	98.10	5.47	6.90	24.00	280.08	1.68	55.88	5.83
V_3 x P_0	71.21	80.33	108.29	4.16	4.99	21.89	204.91	1.22	42.44	5.00
V_3 x P_1	72.38	76.55	105.11	4.76	5.70	22.22	221.16	1.32	44.11	5.18
V_3 x P_2	74.18	74.66	104.11	5.11	6.23	22.88	234.33	1.40	46.66	5.30
V_3 x P_3	77.08	71.77	102.29	5.35	6.62	23.73	264.59	1.58	52.77	5.77
F-Test	S	S	S	S	S	S	S	S	S	S
CD $_{0.05}$	0.87	5.08	4.94	0.90	0.89	1.32	5.48	46.47	2.15	0.28
S. Ed (±)	0.42	2.46	2.37	0.43	0.42	0.63	2.64	22.41	1.03	0.14

Reference:

1. Bade (2017). Effect of Organic manures and bio fertilizers on growth, yield and quality of chilli (*Capsicum annum* L.). cv.PusaJwala. *International Journal of Current Microbiology and Applied Sciences* **6**(5): 2545-2552.

2. Bharadwaj (2021). Effect of organic liquid manures on vegetative growth and yield of pea (*Pisum sativum* L.).

3. Buckseth (2012). Genetic diversity and path analysis in tomato (*Solanum Lycopersicon* L.). *Vegetable Science*. **39**(2):221-223.

4. Dhaliwal (2003). Line –Tester analysis for yield and processing attributes in Tomato. *Journal of Research***40**(1):49-53.

5. Gajjela (2019). Effect of foliar application of Panchagavya and Vermiwash on yield and quality of bitter gourd (*Momordica charantia* L.). *International Journal of Chemical Studies*, **7**(3): 218-224.

6. Gopakkali. P. (2014). Effect of organic production techniques on the growth, yield, quality and economics of chilli (*Capsicum annum*) and soil quality in dry zone of Karnataka. *Indian Journal of Agronomy*, **59**(1): 151-156.

7. Jenny. S. and P. Malliga. (2016). Influence of organic manure on morphological and yield attributes of tomato (*Solanum Lycopersicon* L.). *International Journal of Innovative Research in Science and Engineering* 2347-3207.

8. Nandhakumar. S. (2021). Effect of different growth regulators and their response to physiological and biochemical attributes in Brinjal (*Solanum melongena* L.). *International Journal of Plant and Soil Science.*

9. Sam Ruban, MR Priya, G Barathan, SM Suresh Kumar (2019): Effect of foliar application of bio stimulants on growth and yield of brinjal (*Solanum melongena* L.) *Plant Archives***19** (2): 2126-2128.

10. Saraswathi. T., and Praneetha. S. (2013). Effect of bio stimulants on yield and quality in tomato. *Journal of Horticultural Sciences*, **8**(1): 107-110.

11. Somasundaram (2003). Response of green gram to varied levels of Panchagavya (organic nutrition) foliar spray. *Madras Agricultural Journal*. **90**(1-3): 169-172.

12. Swarnam, T., Velmurugan, A., and Roy, N. (2016). Effect of Foliar Application of Panchagavya on Yield and Quality Characteristics of Eggplant (*Solanum melongena* L.). *Advances in life sciences*. **5**(7): 2636-2639.

13. Uddain (2009). Effect of different plant growth regulators on growth and yield of tomato. *International Journal of Sustainable Agriculture*.**1**(3):58-63.