Influence of different concentrations of Jeevamrutha on growth, yield and quality parameters of Chilli (*Capsicum annum* L.)

ABSTRACT

An experiment on the "Influence of Different Concentrations of Jeevamrutha on Growth, Yield and Quality Parameters of Chilli (*Capsicum annum* L.)" was conducted in Kharif season adapting Factorial randomized block design (FRBD) consisting of 10 treatments and replicated thrice during July to November 2021, in Horticulture research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) India. Results regarding the present investigation shows that cultivation of chilli with different concentrations of Jeevamrutha found as the best option for higher productivity whereas the treatment with concentration of 10% Spray of Jeevamrutha in variety TMPH-443 that is T_5 (TMPH-443 + 10% Spray of Jeevamrutha) showed the best results in terms of Plant height at 30 DAT (39.59cm) and 120 DAT (59.65cm), Days to 50% Flowering (35.92 days), Days to First Harvest (56.03 days), Fruit Length (7.21cm), Fruit Weight (5.80g), Fruit Girth (3.27cm), Number of Fruits Plant^{-1} (78.67fruits), Average Fruit Yield Plant^{-1}(0.46kg), Fruit Yield ha^{-1} (5.07t), TSS (8.10°B), were observed is dark green/green in colour (133). At level T_{10} with same concentration in different variety (TMPH-449) showed the nearest results. Hence the T_5 (TMPH-443 + 10% Spray of Jeevamrutha) is best suited for the farmers in terms of growth, yield, quality and net returns.

Keywords: *Chilli, Jeevamrutha, Hybrid Varieties, Growth, Yield and Quality*

INTRODUCTION

Chilli (*Capsicum annum* L.) is one of the most important commercial crops of India. It belongs to the green Capsicum under the family Solanaceae. Chilli is growing for its pungent fruits, which are used both as green and ripe or dry form. It is becoming an important crop worldwide due to its wide diversity and high quality, flavor, concentration of vitamins and other antioxidants (Bahurup *et al.,* 2013). The pungency in chilli is due to alkaloid capsaicin. The genus Capsicum consists of approximately 22 wild and 5 cultivated species, which includes *C. annuum, C. baccatum, C. chinense, C. frutescens and C. pubenscens*. Chilli has been classified under often cross-pollinated crops and the extent of natural out crossing has also reported up to 66.4 per cent (Singh *et al.,* 1994). A wide range of variability in chilli is available which provide a great scope for improving fruit yield through a systemic and planned selection programme. In India, it is grown throughout the country but principal chilli growing states are Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu, Orissa, Madhya Pradesh, Rajasthan, West Bengal and Uttar Pradesh. Andhra Pradesh, Maharashtra, Karnataka and Tamil Nadu constitute 75% of the total area of its cultivation and production.

Farmers nowadays keep on applying inorganic fertilizer for their crop as it can provide rapid nutrition, but it will increase cost of production. Hence, this study intends to provide an alternative method by using different concentrations of Jeevamrutha for enhancing growth, yield and quality of Chilli hybrids and best of concentrations can be determined for optimum growth, yield and quality of Chilli. The best of organic treatment can be determined for optimum growth, quality and NPK content of Chilli. Farmers may use those treatments as an alternative way in order to avoid excessive application of chemical fertilizer to the soil. Besides, farmers will have a proper management toward nutrients required for growth and completion of life cycle of the Chilli crop. Organic fertilizers may help farmer to increase soil structure, provide food source for soil micro-organisms, provides cation exchange capacity, increases water holding capacity, decrease toxicity at low pH and act as reservoir of plant nutrients (Zaccheo *et al*., 2002, Evanylo *et al.,* 2008 and Mitchell *et al.,* 2006) Therefore, present study was conducted to study the Influence of Different Concentrations of Jeevamrutha on Growth, Yield, Quality Parameters of Chilli. (*Capsicum annum* L.)

To find out the effect of different concentrations of Jeevamrutha on different varieties of Chilli hybrids and To find out the Interaction effect between chilli hybrids and different concentrations of Jeevamrutha.

MATERIALS AND METHOD

A field experiment was conducted during July to November 2021. At Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences,

Prayagraj (U.P). The University is about 7 km away from Prayagraj city and it is geographically situated at 25.50 N latitude, 81.080 E longitudes. The altitude of this location is about 98 meter above the mean sea level. The soil of the experimental field was sandy loam with pH of 6.8. The experiment entitled "Influence of different concentrations of Jeevamrutha on growth, yield and quality parameters of Chilli (*Capsicum annum* L.)." was conducted in Kharif season adapting Factorial randomized block design (FRBD) consisting of 10 treatments and three replications. Transplanting of seedlings were done with spacing 60×45 cm in July 2021. Plot size is 2×2 m^2. The treatments are $T_{1:}$ (V_{1+} J_0) TMPH– 443 Control (Water spray), $T_{2:}$ (V_{1+} J_1) TMPH– 443 + 2.5% (Spray of Jeevamrutha), $T_{3:}$ (V_{1+} J_2) TMPH – 443 + 5% (Spray of Jeevamrutha), $T_{4:}$ (V_{1+} J_3) TMPH– 443 + 7.5% (Spray of Jeevamrutha), $T_{5:}$ (V_{1+} J_4) TMPH– 443 + 10% (Spray of Jeevamrutha), $T_{6:}$ (V_{2+} J_0) TMPH- 449 Control (Water spray), $T_{7:}$ (V_{2+} J_1) TMPH- 449 + 2.5% (Spray of Jeevamrutha), $T_{8:}$ (V_{2+} J_2) TMPH- 449 + 5% (Spray of Jeevamrutha), $T_{9:}$ (V_{2+} J_3) TMPH- 449 + 7.5% (Spray of Jeevamrutha), $T_{10:}$ (V_{2+} J_4) TMPH- 449 + 10% (Spray of Jeevamrutha). The experimental field has an even topography with a gentle slope and good drainage. The sample were drown from each replication of experimental plot at 0-15 cm depth before sowing of the crop and a composite sample was made to determine the physical and chemical properties of soil. Cultural practices and plant protection measures were followed during the cultivation process. Irrigation, weeding and hoeing measures were employed as per the need of the crop. For each treatment of a replication five plants were selected and observations were recorded on various parameters of growth and yield of the crop as per the planned schedule.

PREPARATION OF JEEVAMRUTHA

Jeevamrutha was prepared by mixing 10 kg cow dung, 10 litre cow urine, 2 kg jaggery, 2 kg pigeon pea flour and hand full of soil collected from farm. All these were put in 200 litres plastic drum and mixed thoroughly and volume was made up to 200 litres by adding water. The mixture was stirred well in clockwise direction thrice a day plastic drum was kept shade covered with wet jute bag. Jeevamrutha was fermented for 10 days and applied to the root zone of Chilli plants manually at of 20, 40 and 60 days after transplanting (DAT) as per treatments (Devakumar *et al*., 2008 and Palekar, 2006). Experimental data collected was subjected to statistical analysis by adopting Fisher's method of analysis of variance (ANOVA) as outlined in Gomez and Gomez (1984). Critical difference (C.D) values were calculated whenever the "F" test was significant at 5 per cent level.

RESULTS AND DISCUSSION

The results revealed that Chilli Varities had the following performance mentioned below.

A. Germination Parameters:

Days to germination was observed in Variety TMPH-443, **T_1 (7.44)** and in Variety TMPH-449, **T_6 (10.45)** from days after sowing.

B. Effect of Jeevamrutha on Growth Parameters of Chilli:

Application of Jeevamrutha showed significant effect on plant height, this might have helped in higher growth parameters due the supply of micronutrients, vitamins, essential amino acids and growth promoting substances like Indole Acetic Acid (IAA), Gibberlic Acid (GA3) and beneficial micro-organisms. It is said to enhance microbial activity and ultimately ensuring the availability and uptake of nutrients by the chilli crop. The similar results was observed in Jeevamrutha (Palekar 2006, Sreenivas *et al.*, 2011, Neelima and Sreenivas 2011)

The plant height (cm) at 30 days was observed in Variety TMPH-443 with interaction of Jeevamrutha 10% concentration i.e., treatment **T_5 (39.59 cm),** and in Variety TMPH-449 with concentration of 10% Jeevamrutha i.e., treatment **T_{10} (38.46 cm),** at 45 days in Variety TMPH-443 **T_5 (48.18cm)**, and in Variety TMPH-449 **T_{10} (45.68 cm),** at 60 days in Variety TMPH-443 **T_5 (56.48cm)**, and in Variety TMPH-449 **T_{10} (54.88 cm),** at 120 days in Variety TMPH-443 **T_5 (59.65cm)**, and in Variety TMPH-449 **T_{10} (57.52 cm)** and Leaf Area in Variety TMPH-449 with interaction of Jeevamrutha 10% concentration i.e., treatment **T_{10} (42.47cm)**, and in Variety TMPH-443 in treatment **T_5 (19.40cm).** The application of Jeevamrutha might have helped in greater availability of nutrients which enhance the uptake of nitrogen, total phosphorus and total potassium. This might have shown higher foliage with dark green coloured leaves indicating rich chlorophyll content might be responsible for production of more photosynthates and translocation to the vegetative buds, fruits and increased the leaves in chilli plant.

C. Effect of Jeevamrutha on Yield Parameters of Chilli:

The appropriate integration of Jeevamrutha with Cow urine is capable of providing an optimal level of nutrients triggering early blooming in the treatment of chilli crop. This similar observation was recorded by Boraiah *et al.*, (2017). Application of Jeevamrutha increased fruit length, fruit weight, fruit girth and yield of chilli. Significantly higher number of growth components and yield components in jeevamrutha was due to higher amount of nutrient content like nitrogen, phosphorus and potassium (1.96%, 0.280% and 0.170% respectively) and also contains Mg (46ppm) and Cu (51ppm) and maximum microbial population (Maximum CFU of bacteria (855), Fungi (29), Actinomycetes (8), N-fixers (69) and P-solubilizer (80) was observed in Jeevamrutha (Devakumar *et al.,* 2008 and 2014).

Days to 50% flowering in Variety TMPH-443 with interaction of Jeevamrutha 10% concentration i.e., treatment **T_5 (35.92 days)**, and in Variety TMPH-449 with concentration of 10% Jeevamrutha i.e., in treatment **T_{10} (37.14 days),** Days to first harvest in Variety TMPH-443 **T_5 (56.03 days)**, and in Variety TMPH-449 **T_{10} (57.25 days),** Fruit length in Variety TMPH-443 **T_5 (7.21cm)**, and in Variety TMPH-449 **T_{10} (6.54 cm)**, Fruit weight in Variety TMPH-443 **T_5 (5.80 g)**, and in Variety TMPH-449 **T_{10}(5.23g),** Fruit girth in Variety TMPH-443 **T_5 (3.27 cm)**, and in Variety TMPH-449 **T_{10} (3.07cm),** No. of fruits Plant^{-1} in Variety TMPH-443 **T_5 (78.67 fruits)**, and in Variety TMPH-449 **T_{10} (73.66 fruits),** Average fruit yield kg Plant^{-1} in Variety TMPH-443 **T_5 (0.46 kg)**, and in Variety TMPH-449 **T_{10} (0.39 kg),** Fruit yield tonnes ha^{-1} in Variety TMPH-443 **T_5 (5.07 t)**, and in Variety TMPH-449 **T_{10} (4.30 t).** Early flowering maybe due to integration effect of Jeevamrutha which contains soil microbes, cyanobacteria, PSB and growth hormones such as auxin, gibberellin and cytokinin's all of which influence and enhance nitrogen, phosphorus, potassium and essential nutrients efficiency a way that chemical fertilizers do not.

D. Effect of Jeevamrutha on Quality Parameters of Chilli:

The term quality implies the degree of excellence of a product or its suitability for a particular use. Quality of produce encompasses appearance, texture, nutritive values, chemical constituents, mechanical properties, functional properties and defects. In present investigation application of Jeevamrutha improved the quality parameters *viz.*, TSS content, and fruit colour of Chilli as compared to different concentration sources of Jeevamrutha application. In this resent investigation the results showed that the maximum TSS (°Brix) was observed in Variety TMPH-443 with interaction of Jeevamrutha 10% concentration i.e., treatment **T_5 of (8.10°B)** and in Variety TMPH-449 in treatment **T_{10} (8.03°B).** The increase in TSS might be due to synthesis of auxin which in turn increased synthesis of metabolites and their rapid translocation from other parts of plants to developing fruits. However, fruits acted as a strong sink for drawing metabolites from the leaves.

In case of Fruit colour of chilli. Variety TMPH-443 with T_1 (Water spray), T_2 (2.5% concentration of Jeevamrutha), T_3 (5% concentration of Jeevamrutha), T_4 (7.5% concentration of Jeevamrutha) and T_5(10% concentration of Jeevamrutha) were observed in Dark green colour **(133),** While the Variety TMPH-449 T_6 (Water spray), T_7 (2.5% concentration of Jeevamrutha), T_8 (5% concentration of Jeevamrutha), T_9 (7.5% concentration of Jeevamrutha) and T_{10} (10% concentration of Jeevamrutha) were observed in Light green colour **(142).** The Jeevamrutha application might have shown higher foliage with dark green coloured leaves indicating rich chlorophyll content might be responsible for production of more photosynthates and translocation to the vegetative buds and fruits which showed the variation of colour in the chilli fruits.

Growth Parameters															
Plant Height (cm) 30DAT				**Plant Height (cm) 45DAT**			**Plant Height (cm) 60DAT**			**Plant Height (cm) 120DAT**			**Leaf Area (cm²)**		
V/J (cm)	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**
J_0	32.38	30.49	**31.43**	41.22	40.08	**40.65**	47.92	46.23	**47.08**	50.81	48.6	**49.7**	12.33	32.9	**22.62**
J_1	34.17	31.2	**32.68**	42.28	41.3	**41.79**	49.12	48.12	**48.62**	53.36	51.62	**52.49**	13.4	35.33	**24.37**
J_2	37.19	35.77	**36.48**	43.18	42.33	**42.76**	51.81	50.57	**51.19**	55.45	54.55	**55**	15.97	37.47	**26.72**
J_3	38.25	37.68	**37.97**	45.49	44.77	**45.13**	54.78	53.37	**54.07**	56.51	56.27	**56.39**	17.4	39.33	**28.37**
J_4	39.59	38.46	**39.03**	48.18	45.68	**46.93**	56.48	54.88	**55.68**	59.65	57.52	**58.59**	19.4	42.47	**30.93**
Mean V	**36.32**	**34.72**		**44.07**	**42.83**		**52.02**	**50.64**		**55.16**	**53.71**		**15.7**	**37.5**	
		C.D (0.05)	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**
V		**0.61**	**0.29**	**V**	**0.67**	**0.32**	**V**	**1.28**	**0.61**	**V**	**0.68**	**0.32**	**V**	0.67	0.32
J		**0.97**	**0.46**	**J**	**1.07**	**0.51**	**J**	**2.02**	**0.96**	**J**	**1.07**	**0.51**	**J**	1.07	0.51
V×J		**1.37**	**0.65**	**V×J**	**1.51**	**0.72**	**V×J**	**2.86**	**1.36**	**V×J**	**1.51**	**0.72**	**V×J**	1.51	0.72

CD at 5%, DAT is Days after transplanting, V- Variety, J- Jeevamrutha, V_1-Variety1(TMPH-443), V_2– Variety 2(TMPH-449), J_0- Water spray, J_1- 2.5% Jeevamrutha, J_2- 5% Jeevamrutha, J_3- 7.5% Jeevamrutha, J_4- 10% Jeevamrutha

Yield Parameters																		
Days to 50% flowering			**Days to First Harvest**			**Fruit Length (cm)**			**Fruit Weight (g)**			**Fruit Girth (cm)**			**Number of Fruits Plant^{-1}**		
V_1	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**
42.5	42.8	**42.7**	67.0	68.7	**67.9**	4.6	4.3	**4.5**	3.6	3.4	**3.5**	2.6	2.3	**2.5**	56.1	53.5	**54.8**
41.6	42.4	**42.0**	63.5	64.9	**64.2**	5.0	4.8	**4.9**	3.8	3.7	**3.8**	2.7	2.6	**2.7**	63.5	58.6	**61.0**
39.3	39.8	**39.5**	61.4	62.1	**61.8**	5.8	5.1	**5.4**	4.2	4.1	**4.1**	2.9	2.7	**2.8**	67.5	67.7	**67.6**
38.1	39.0	**38.6**	60.2	61.1	**60.7**	6.2	6.2	**6.2**	4.5	4.2	**4.4**	3.0	2.9	**2.9**	70.8	69.7	**70.2**
35.9	37.1	**36.5**	56.0	57.3	**56.6**	7.2	6.5	**6.9**	5.8	5.2	**5.5**	3.3	3.1	**3.2**	78.7	73.7	**76.2**
39.5	**40.2**		**61.6**	**62.8**		**5.8**	**5.4**		**4.4**	**4.1**		**2.9**	**2.7**		**67.3**	**64.6**	
	C.D (0.05)	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**		**C.D (0.05)**	**S.Ed (±)**
V	0.66	0.31	**V**	0.61	0.29	**V**	0.37	0.18	**V**	0.17	0.1	**V**	0.17	0.08	**V**	0.87	0.41
J	1.04	0.50	**J**	0.96	0.46	**J**	0.58	0.28	**J**	0.27	0.16	**J**	0.27	0.13	**J**	1.37	0.65
V×J	1.47	0.70	**V×J**	1.36	0.65	**V×J**	0.82	0.39	**V×J**	0.38	0.23	**V×J**	0.38	0.19	**V×J**	1.94	0.92

CD at 5% , DAT is Days after transplanting, V-Variety, J- Jeevamrutha, V_1-Variety1(TMPH-443), V_2– Variety 2(TMPH-449), J_0- Water spray, J_1- 2.5% Jeevamrutha, J_2- 5% Jeevamrutha, J_3- 7.5% Jeevamrutha, J_4- 10% Jeevamrutha

Yield Parameters					
Fruit Yield kg plant^{-1}			Fruit Yield Tonnes Hactare^{-1}		
V_1	**V_2**	**Mean J**	**V_2**	**Mean J**	**Mean B**
0.2	0.2	**0.2**	2.3	2.0	**2.2**
0.2	0.2	**0.2**	2.7	2.4	**2.6**
0.3	0.3	**0.3**	3.1	3.1	**3.1**
0.3	0.3	**0.3**	3.5	3.3	**3.4**
0.5	0.4	**0.4**	5.1	4.3	**4.7**
0.3	**0.3**		**3.3**	**3.0**	
	C.D $_{(0.05)}$	**S.Ed (±)**		**C.D $_{(0.05)}$**	**S.Ed (±)**
V	0.02	0.01	**V**	0.17	0.08
J	0.02	0.01	**J**	0.27	0.13
V×J	0.02	0.02	**V×J**	0.38	0.19

CD at 5%, V- Variety, J- Jeevamrutha, V_1-Variety1(TMPH-443), V_2– Variety 2(TMPH-449), J_0- Water spray, J_1- 2.5% Jeevamrutha, J_2- 5% Jeevamrutha, J_3- 7.5% Jeevamrutha, J_4- 10% Jeevamrutha

Quality Parameters						
TSS (°Brix)				Fruit Colour		
V/J (°Brix)	**V_1**	**V_2**	**Mean J**	**V_1**	**V_2**	**Mean J**
J_0	7.47	7.33	**7.4**	132	141	**137**
J_1	7.73	7.7	**7.72**	134	143	**138**
J_2	7.87	7.8	**7.83**	132	141	**137**
J_3	7.93	7.9	**7.92**	134	142	**138**
J_4	8.1	8.03	**8.07**	134	143	**139**
Mean V	**7.82**	**7.75**		**133**	**142**	
		C.D $_{(0.05)}$	**S.Ed (±)**		**C.D $_{(0.05)}$**	**S.Ed (±)**
V		0.1	0.08	**V**	1.056	0.499
J		0.16	0.12	**J**	1.67	0.789
V×J		0.23	0.17	**V×J**	2.26	1.116

CD at 5%, V- Variety, J- Jeevamrutha, V_1-Variety1(TMPH-443), V_2– Variety 2(TMPH-449), J_0- Water spray, J_1- 2.5% Jeevamrutha, J_2- 5% Jeevamrutha, J_3- 7.5% Jeevamrutha, J_4- 10% Jeevamrutha

CONCLUSION

Based on the results of the present investigation entitled "Influence of Different Concentrations of Jeevamrutha on Growth, Yield, Quality Parameters of Chilli. (*Capsicum annum* L.)" it is concluded that cultivation of chilli with different concentrations of Jeevamrutha found as the best option for higher productivity whereas the treatment with concentration of 10% Spray of Jeevamrutha in variety TMPH-443 that is T_5 (TMPH-443 + 10% Spray of Jeevamrutha) showed the best results in terms of vegetative growth, yield and quality. At level T_{10} with same concentration in different variety (TMPH-449) showed the nearest results. Hence the T_5 (TMPH-443 + 10% Spray of Jeevamrutha) is best suited for the farmers in terms of growth, yield and quality.

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