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Effect of Different Growing Media on Growth, Establishment and Survival of Passion Fruit (*Passiflora edulis* Sims.) cv. Coorg Purple

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Authors' contributions

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

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ABSTRACT

The current study was conducted in the Research Field at the SHUATS, Prayagraj, Department of Horticulture, from 2020 to 2021. Seven treatments were used in the experiment, which included growing media (farm yard manure, vermicompost, and poultry manure) on passion fruit. The experiment was carried out using a Randomized Block Design (RBD). the treatments were T1 Control (RDF 100% NPK)/ Plant, T2 Vermicompost (50%) +Poultry Manure (25%) + FYM (25%), T3 Vermicompost (25%) +Poultry Manure (50%) + FYM (25%), T4 Vermicompost (25%) + Poultry Manure (25%) + FYM (50%), T5 Poultry Manure (50%) + FYM (50%), T6 Poultry Manure (50%) + Vermicompost (50%) and T7 FYM (50%) + Vermicompost (50%). The results from the present investigation revealed that treatment T7 followed by T4 and T5 was found superior in terms of Survival percentage and growth parameters of Passion fruit in growing media i.e. (Vermicompost, Poultry manures, and Farm yard manures), in an agro-climatic condition of Prayagraj in terms of cost of cultivation maximum cost was recorded in treatment T3 and minimum in treatment T1.

Keywords: Passion fruit; growing media; FYM; vermicompost and poultry manure.

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1. INTRODUCTION

The passion fruit (Passiflora edulis Sims) is the origin of Brazil. It belongs to the family Passifloraceae (ces.ncsu.edu). Most of the world's tropical and subtropical regions, including South America, Australia, Asia, and Africa, are where it is grown (krishi.icar.gov. 2021).

The climate that the passion fruit prefers is tropical or subtropical with moderate rainfall of 100–250 cm. It can be found growing between 800 and 1500 meters above sea level. Cool temperatures (18–23°C) are ideal for purple passion fruit flower initiation and fruit set, whilst moderately warm temperatures (18–23°C) are required to encourage juice production and quality enhancement (krishi.icar.gov. 2021).

Though brought to India at the beginning of the 20th century, passion fruit farming was only practiced in a few regions in Karnataka, Kerala, and Tamil Nadu. In various regions of northern India, particularly the North-Eastern states, passion fruit farming has begun over the past ten years [1].

The anticipated overall world production of passion fruit is 8.52 lakh tones, with Brazil, Mexico, Ecuador, Australia, Zimbabwe, Kenya, and Columbia being the main producers [2].

The performance of seedlings in nurseries is highly dependent on the growth media, which then (Baiyeri, 2005). In both the nursery as well as the field, the use of the proper growing media has been a significant element determining seedling growth and survival. Increased passion fruit output will also boost the manufacturing of various post-harvest goods, and increased export volume will increase our foreign currency income. People living in India's subtropical and tropical regions would have better health as a result of increased passion fruit consumption and awareness. Typically, 4 to 5 years after planting, fruit-bearing tropical and subtropical fruit plants begin to grow. However, a fruit plant, whether it has been grown from seeds or cuttings, begins to develop fruit in two to three years. To check this research trail on “To assess the effect of growing medias on growth, Establishment and Survival of passion fruit.” was conducted in Research field, Department of Horticulture, SHUATS, Prayagraj.

2. MATERIALS AND METHODS

The Experimental was conducted in Randomized Block Design (RBD) with 7 treatments and 3 replications in the Research field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2020 - 2021. The total number of treatments was seven viz. T1 Control (RDF 100% NPK)/ Plant, T2 Vermicompost (50%) +Poultry Manure (25%) + FYM (25%), T3 Vermicompost (25%) +Poultry Manure (50%) + FYM (25%), T4 Vermicompost (25%) + Poultry Manure (25 %) + FYM (50%), T5 Poultry Manure (50%) + FYM (50%), T6 Poultry Manure (50%) + Vermicompost (50%) and T7 FYM (50%) + Vermicompost (50%).

2.1 The Climatic Condition in the Experimental Site

The Prayagraj district is part of the subtropical zone in the south of Uttar Pradesh, which has very hot summers and moderately mild winters. The place's highest temperature rarely drops below 4ºC or 5ºC and can reach up to 46ºC or 48ºC. In this area, there is approximately 1013.4 mm of yearly rainfall. However, sporadic precipitation is also prevalent in the wintertime (Dubey Bhaskar and Singh Devi, 2021).

3. RESULTS AND DISCUSSION

The passion fruit cultivar Coorg purple was the subject of the current inquiry. In order to record the observations, tags were planted with a 2 m x 2 m spacing. The experiment's results are outlined in the headings that follow.

3.1 (A.) Growth Parameters

For the parameter "Number of leaves/vine," the highest number of leaves was recorded in T7 FYM (50%) + Vermicompost (50%) followed by T5 (Poultry Manure (50%) + FYM (50%) with (16.85,28.88,43.10, and 55.08 leaves/vines) at 30,60,90, and 120 days, respectively. The lowest number of leaves was recorded in T1 at 30, 60, 90 and 120 days, respectively (Control). This increase may be attributable to the use of more vermicompost and farmyard manure as medium, which promotes the vegetative growth of passion fruit [3,4], (Gupta et al. 2013). All reported findings of a similar nature (2019). The highest number of branches per vine (1.49,2.40,3.27, and 4.73) was observed in T7 (FYM (50%) + Vermicompost (50%) and was followed by T5 (Poultry Manure(50%) +FYM (50%) with (1.34,2.19,3.17, and 4.53 branches/vines) at 30,60,90, and 120 days correspondingly. The lowest number of branches (1.03,1.62,2.15, and3.30) per (Control). This may be because the

plants' vegetative growth was improved by the addition of increased amounts of N, P, and K from vermicompost and farmyard manure, which led to better nutrient accumulation and improved plant growth [3-6].

Maximum vine spread (16.70,20.86,29.54, and 37.33 cm) at 30,60,90, and 120 days, respectively, was recorded in T7 FYM (50%) + Vermicompost (50%) followed by T4 (Vermicompost (25%) + Poultry Manure (25%) + FYM(50%) with(15.15,18.93,27.05, and 33.45 cm), whereas minimum vine spread (8.87,12.34, 16. (Control) [3,7]. This could be due to the plants' vegetative growth was improved by the addition of increased levels of N, P, and K from farm yard manure and vermicompost, which led to a better accumulation of nutrients that promote plant growth [5,6]

Similarly in Number of tendrils/vines maximum number of tendrils/vines 11.80 was recorded in treatment T_7 (FYM (50%) + Vermicompost (50%), followed by T_5 (Poultry Manure (50%) + FYM (50%) with 10.96 tendrils/vines, whereas minimum 7.40 tendrils/vines were observed in treatment T_1 (Control). The improvement in number of tendrils/vines as a result of feeding of Farm yard manure, vermicompost and poultry manure might be due to enhanced photosynthetic and other metabolic activities which lead to increase in various plant metabolites responsible for cell division and elongation [3], (dubey and singh 2021).

The treatment T7 (FYM (50%) + Vermicompost (50%), which also had the highest stem girth of 2.93 mm, was followed by T4 (Vermicompost (25%) + Poultry Manure (25%) + FYM (50%) and had the lowest stem girth of 2.10 mm (Control). This may be the result of improved photosynthesis, carbohydrate accumulation, and cell wall and differentiation development as these factors stimulate total vegetative growth, biological activity of the plants, and retention of more leaves, which increased plant size in addition to widening the stem. Regarding stems (mm) The treatment T7 (FYM (50%) + Vermicompost (50%), which also had the highest stem girth of 2.93 mm, was followed by T4 (Vermicompost (25%) + Poultry Manure (25%) + FYM (50%) and had the lowest stem girth of 2.10 mm (Control). This may be the result of improved photosynthesis, carbohydrate accumulation, and cell wall and differentiation development as these factors stimulate total vegetative growth, biological activity of the plants, and retention of more leaves, which increased plant size in addition to widening the stem in the strawberry study [8]. Archana (2008) in the guava study and Ram et al. [9], in the plum study.

In terms of Leaf area maximum Leaf area 157.89 cm^2, was recorded in treatment T_7 (FYM (50%) + Vermicompost (50%), followed by T_5 (Poultry Manure (50%) + FYM (50%) with 131.58 cm^2, whereas minimum 114.74 cm^2, was observed in treatment T_1 (Control) [8,10]. After applying farmyard manure and vermicompost, treatment T7's maximum leaf area may have resulted from improved photosynthetic and other metabolic processes that raised plant metabolites involved in cell division and elongation. (Karaman *et al.* 2013), [11].

In terms of survival percentage, treatment T7 FYM (50%) + Vermicompost (50%)) had the highest maximum survival percentage (90.49%), followed by T3 (Vermicompost(25%)+Poultry Manure (50%) +FYM (25%)), with an82.70%, while treatment T1 had the lowest minimum survival percentage (73.52%). (Control). In terms of survival percentage, treatment T7 (FYM (50%) + Vermicompost (50%)) had the highest maximum survival percentage (90.49%), followed by T3 (Vermicompost (25%) +Poultry Manure (50%) +FYM (25%)), with an 82.70%, while treatment T1 had the lowest minimum survival percentage (73.52%). (Control). The investigation's findings demonstrated that all plants survived when NPK, vermicompost, poultry manure, and farmyard manure were applied. Treatment T7's maximum survival percentage of 90.49% (FYM (50%) + vermicompost (50%)), which was followed by T3's minimum survival percentage of 73.52% (vermicompost (25%) + poultry manure (50%) + FYM (25%) was recorded (control). These findings concur with [11,12].

Similar patterns were seen for vine length, where treatment T7 (FYM(50%) + Vermicompost (50%) recorded highest vine length at 30,60,90, and 120 days, respectively, followed by T4 (Vermicompost (25%) + Poultry Manure (25%) + FYM (50%) with (33.77, 43.34, 52.53 and 60.75 cm), at30,60,90, and 120 days, respectively, whereas minimum vine length (16.22, (Control) [3,13]. This may be attributed to the vermicompost and farmyard manure's rich supply of Potash, Nitrogen, and Phosphorus, which assisted the plants' improved photosynthesis and helped them achieve vigor and ultimately growth characteristics, Vine length [14,15].

In terms of Economics the maximum Cost of cultivation (Rs. 128000.00)/ha is recorded in T_3 (Vermicompost (25%) + Poultry Manure (50%) + FYM (25%) followed by T_2 (Vermicompost (50%) + Poultry Manure (25%) + FYM (25%) with (Rs. 125000.00)/ha, minimum cost of cultivation (Rs. 110225.00) was recorded in T_1 (Control (RDF 100% NPK)/ Plant).

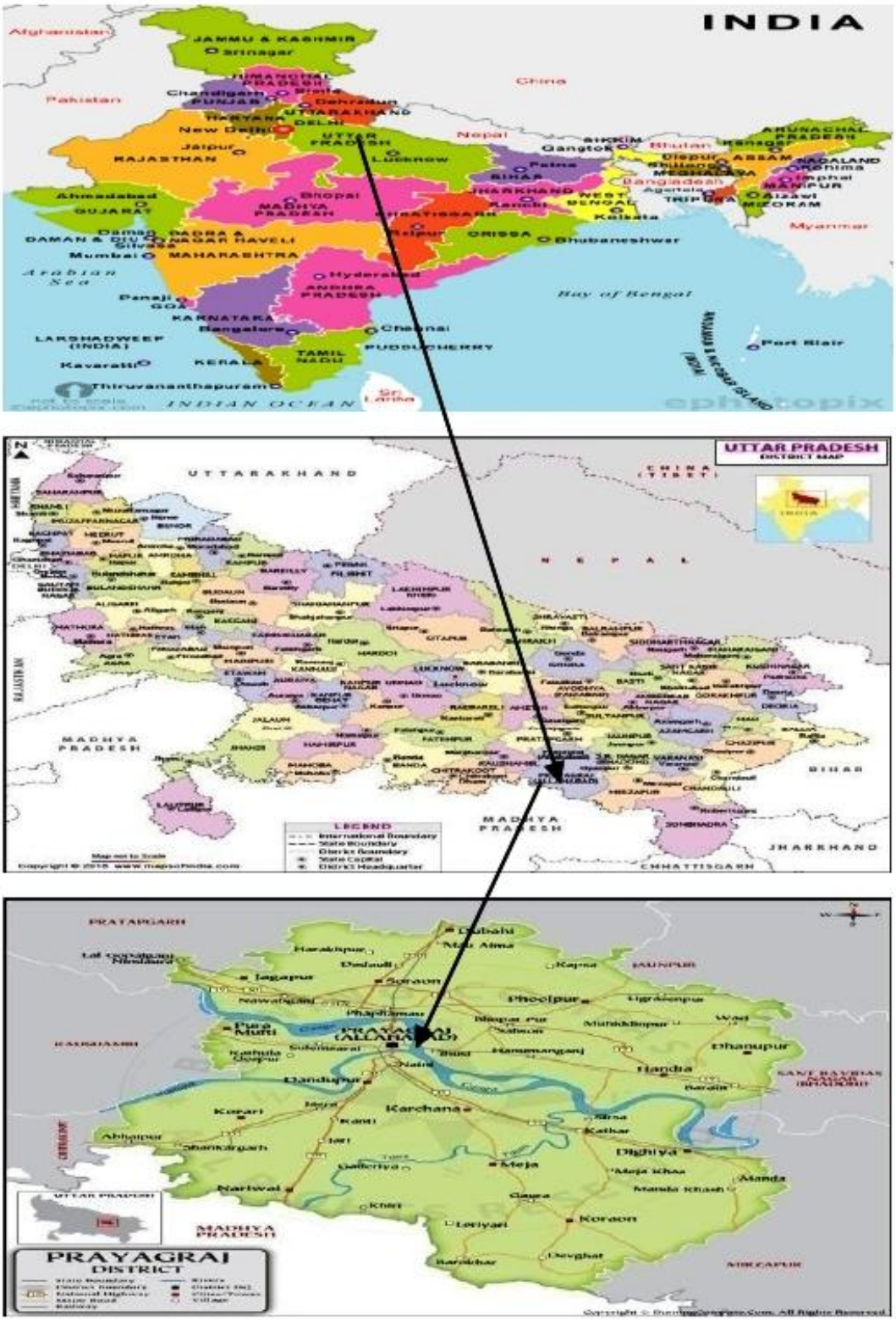

Fig. 1. Map of study area district Prayagraj in Uttar Pradesh (India)

Table 1. Effect of different growing media on vine spread, number of tendrils/vines, stem girth (mm), leaf area (cm2) and total cost of cultivation of passion fruit

Treatment symbol	Treatment combination	Vine spread (cm)				Number of tendrils/vine	Stem girth (mm)	Leaf area (cm2)	Total cost (Rs/ha)
		30 DAT	60 DAT	90 DAT	120 DAT				
T1	Control (RDF 100% NPK)/ Plant	8.87	12.34	16.43	20.96	7.40	2.10	119.70	110225
T2	Vermicompost (50%) +Poultry Manure (25%) +FYM (25%)	12.10	16.03	22.06	27.59	8.14	2.46	114.74	125000
T3	Vermicompost (25%) +Poultry Manure (50%) +FYM (25%)	13.28	16.75	23.83	29.46	9.76	2.62	120.70	128000
T4	Vermicompost (25%) + Poultry Manure (25 %) + FYM (50%)	15.15	18.93	27.05	33.45	10.72	2.90	125.22	123500
T5	Poultry Manure (50%) + FYM (50%)	11.81	15.54	21.51	27.03	10.96	2.75	131.58	123000
T6	Poultry Manure (50%) + Vermicompost (50%)	13.67	17.48	24.71	31.12	9.05	2.41	127.20	124000
T7	FYM (50%) + Vermicompost (50%)	16.70	20.86	29.54	37.33	11.80	2.93	157.89	122000
F-Test		S	S	S	S	S	S	S	
SE(d)		0.278	0.338	0.505	0.639	0.115	0.028	1.403	
C.V.		2.606	2.459	2.620	2.646	1.452	1.343	1.341	
C.D. at 5%		0.613	0.745	1.112	1.407	0.253	0.063	3.090	

Table 2. Effect of different growing media on survival percentage, vine length, number of leaves/vine and number of branches/vines of passion fruit

Treatment Symbol	Treatment Combination	Survival (%)	Vine Length (cm)				Number of leaves/vines				Number of Branches/Vine			
			30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T1	Control (RDF 100% NPK)/ Plant	73.52	16.22	24.08	30.43	36.75	11.37	19.52	29.16	37.18	1.03	1.62	2.15	3.30
T2	Vermicompost (50%) +Poultry Manure (25%) +FYM (25%)	78.12	23.50	31.55	40.50	47.56	12.51	21.44	32.07	40.84	1.08	1.75	2.42	3.51
T3	Vermicompost (25%) +Poultry Manure (50%) +FYM (25%)	82.70	28.80	37.01	45.84	53.71	14 .97	25.76	38.53	49.05	1.14	1.85	2.56	3.77
T4	Vermicompost (25%) + Poultry Manure (25 %) + FYM (50%)	80.91	33.77	43.34	52.53	60.75	16.46	28.20	42.28	53.82	1.20	2.09	3.17	4.44

Treatment Symbol	Treatment Combination	Survival (%)	Vine Length (cm)				Number of leaves/vines				Number of Branches/Vine			
			30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T5	Poultry Manure (50%) + FYM (50%)	79.71	31.11	40.43	48.35	55.84	16.85	28.88	43.10	55.08	1.34	2.19	3.06	4.53
T6	Poultry Manure (50%) + Vermicompost (50%)	82.08	24.88	33.59	41.97	50.14	13.99	23.97	35.85	45.49	1.06	1.80	2.65	3.54
T7	FYM (50%) + Vermicompost (50%)	90.49	40.20	50.54	60.52	69.74	18.10	31.11	46.77	59.30	1.49	2.40	3.27	4.73
F-Test		S	S	S	S	S	S	S	S	S	S	S	S	S
SE(d)		0.502	0.520	0.493	0.484	0.485	0.195	0.329	0.404	0.585	0.020	0.024	0.024	0.107
C.V.		0.759	2.246	1.622	1.297	1.110	1.600	1.578	1.295	1.471	2.085	1.478	1.066	3.294
C.D. at 5%		1.106	1.146	1.086	1.067	1.068	0.429	0.725	0.891	1.288	0.045	0.052	0.053	0.235

4. CONCLUSION

According to the results of the investigation, treatment T7, followed by treatments T4 and T5, was superior in terms of the survival percentage and growth parameters of the passion fruit in the growing media (vermicompost, poultry manures, and farm yard manures), in the agro-climatic conditions of Prayagraj. In terms of cultivation costs, treatment T3 had the highest cost, and treatment T1 had the lowest.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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