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Effect of Different Organic Manures on Establishment of Passion Fruit (*Passiflora edulis Sims.*) cv. Coorg Purple and Coorg Yellow under Prayagraj Agro-climatic Conditions

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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 experiment entitled "Effect of different organic manures on establishment of passion fruit (*Passiflora edulis* Sims.) cv. Coorg Purple and Coorg Yellow under Prayagraj Agro-climatic conditions" was carried out at Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj during the year 2020-2021.The experiment were laid out in Randomized Block Design comprising of 8 treatments *viz*., T_1 Control, T_2 Poultry manure (100%), T_3 FYM (100%), T_4 Vermicompost (100%), T_5 Control, T_6 Poultry manure (100%), T_7 FYM (100%) and T_8 Vermicompost (100%), with three replications. The use of appropriate organic manure can help in its early growth, development & establishment and also there will be an efficient use of some of the animal wastes. The growing media here to be used are also cheap, efficient & easily available, suitable for the farmer's use. Result showed that treatment T_4 performed best in terms of plant height (86.77cm), number of branches plant (3.99) , number of leaves plant (40.33), stem girth (4.69mm), leaf area (124 sq/cm) and Chlorophyll Content (92.39 µmol per m2) .

Keywords: Passion fruit; organic media; FYM; vermicompost.

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1. INTRODUCTION

Passion fruit (*Passiflora edulis*) which is a native of tropical America (Brazil), belongs to the family Passifloraceae, is a high value and export oriented crop. Passion fruit stands out for its remarkable nutritional and therapeutic qualities in addition to its unusual and distinctive flavour and aroma. The passion fruit juice is acidic by nature, has a great flavour, is quite delicious, nutritious, and well-liked by most people for its blending ability. The minerals sodium, magnesium, sulphur, chlorides, and absorbic acid are all present in moderate amounts in passion fruit, which is also an excellent source of vitamin A, riboflavin, and niacin.

In India, passion fruit cultivation is confined to Kerala, Tamil Nadu (Nilgiri hills and Kodaikanal), Karnataka (Coorg) and North eastern states (Mizoram, Nagaland, Manipur and Sikkim) with an area and production of 9.11 thousand ha and 45.82 thousand tons. The fruit is a good source of vitamins A and C. Purple (*Passiflora edulis* Sims.) and yellow passion fruit are the two varieties that are known to be edible (*Passiflora edulis f. flavicarpa* Deg.).

The two widely cultivated varieties: a purple colour fruit type, *P. edulis f. edulis*, and the yellow colour fruit type *P. edulis f. flavicarpa*. Passion fruit vines usually produces a single flower at each node of the plant with a width of 5-7.5cm. The flower of passion fruit have five oblong greens sepals and five white petals. The sepals and petals of passion fruit is purple and has five stamens, a branched style and ovary. The style of passion flower tends to bend and anthers of the flower are situated on top of the style with very distinct head on top. According to BERNACCI et al. (2008), the yellow passion fruit, also known as P. edulis forma flavicarpa, was bred in Australia and could be identified by the colour of the fruit, the corona's deeper shade of purple, and the presence of glands on the sepals. These distinctions are meaningless because the glands are shared by all species (though they may be absent), and the corona comes in a variety of colours regardless of the colour of the fruit.

Areas identified as requiring immediate attention includes fertilizer recommendation for optimum fruit yield and quality. Fertilizer recommendations in particular have been variable. As these medias are well suited, cheap & are easily available, these could be suitable for farmer's use. It has been suggested that using organic manures could help preserve and boost agricultural yields and soil fertility [1-3].

Organic manures have been advocated as a potential means of maintaining and increasing soil fertility and crop yields (Titiloye, 1982; Agboola and Adeoye, 1990; Anikwe, 2000). Soil organic matter is a natural reservoir that provides nitrogen, phosphorus, and sulphur to large areas of soil while also protecting it from erosion. Organic matter also provides desirable aggregate formation substances by loosening the soil to allow for easy movement of air and water. (Donahue et al., 1983). Organic matter is important for maintaining soil condition and productive capacity in Australia's cereal According to studies by Aitken et al. (1990) and Fenton and Helyar (2007), soil organic matter can act as a buffer against the significant acidification brought on by nitrate leaching and the removal of exchangeable cations like Ca and Mg from agricultural produce. The management of soil organic matter is crucial to regulating soil health and preserving soil condition, which are both significant factors.

Organic matter serves as a reservoir for plant nutrients, preventing their loss through leaching and promoting plant growth. Earthworms and other beneficial soil creatures are also encouraged by the habitat created by organic manure. Mineralization of organic matter results in the release of significant amounts of nitrogen, phosphorus, sulphur, and minor amounts of micronutrients. Farmyard manure is nutrient-rich and raises the fertility of the soil. It refers to the decomposed mixture of dung and urine and farm animals along with litter and left over material from roughages or fodder fed to the cattle. Farmyard manure that has properly decomposed comprises 0.5% N, 0.2% P2O5, and 0.5% K2O.

Application of vermicompost in crop production is an important aspect of organic farming. Vermicompost can be used as effective 22manure in crop production as well as biofertiliser in maintaining soil health [4,5]. Vermicompost is a rich nutritive organic fertilizer due to rich in humus, micronutrients, and beneficial soil microbes- nitrogen fixing and phosphorus solubilizing bacteria and actinomycetes and growth hormones "auxins" , „gibberlins" and cytokinins". Vermicompost contains several nutrient elements such as N-1.9%, C:N- 13.6 %, P- 2%, K- 0.8%, Zn- 100ppm and Mn- 500ppm. Hence, the experiment at the

Horticulture Research Farm, Department of Horticulture, SHUATS, Prayagraj was carried out during 2020-2022 with the objectives.

To determine the effect of different organic manures (poultry, FYM, vermicompost) on growth and survival of passion fruit.

2. MATERIALS AND METHODS

The experiment entitled was carried out the Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. Prayagraj is situated in the agro climatic zone (Sub-tropical belt) of Uttar Pradesh state. Geographically, Allahabad is located at of 20^0 15' North latitude, 60^0 3" East longitudes and at an altitude of 678 meters above mean sea level (MSL). The maximum temperature of the location reaches up to 46 ^{0}C – 48 ^{0}C and seldom falls as low as 4 ^{0}C – 5 ^{0}C. The relative humidity ranged between 20 to 94 per cent. The average rainfall in this areais around 1013.4 mm annually.

The experiment was laid out in Randomized Block Design (RBD) with three replications. The treatment consisted of different levels of FYM, Poultry Manure and Vermicompost. Thus, there were eight treatment combination including control *viz*, T_1 Control, T_2 Poultry manure (100%), T_3 FYM (100%), T_4 Vermicompost (100%), T_5 Control, T_6 Poultry (100%), T_7 FYM (100%), T_8 Vermicompost (100%). The entire organic manures materials were applied as a basal dose. Then required doses of fertilizers were applied 1st the month of December 2021. For the application of organic manures, the top soil surrounding the plant (equivalent to the plant's leaf canopy) was dug up to a depth of 30 cm, and the manures were evenly mixed into the soil before being levelled. Weeding was done on every 15 days interval and Irrigation was done every alternative day, mostly in evening. The data collected on different parameters during the course of investigation were subjected to statistical analysis as per method of analysis of variance (Fisher 1918). The "F" variance ratio test was used to determine the significance and non-significance of the treatment effect. At a 5% level of significance, the calculated "F" value (variance ratio) was contrasted with the table value of "F". It was decided that an effect was considerable if the calculated value was higher than the table value. At a 5% level of significance, the critical difference was compared to the significant difference between the means.

3. RESULTS AND DISCUSSION

The progressive increase in plant height (86.77cm) was recorded in T_4 Vermicompost 100% followed by (82.22cm) in T_6 poultry manure 100% and the minimum plant height was recorded in T_1 Control with a reading of (61.57cm). The present findings corroborate with those of Athani et al., (2007), Naik and Babu [6], Ram et al., (2007), Ram and Pathak [7], Kumar et al., [8], Dutta et al., [9], Patel et al., (2009), Shukla et al., [10], Dwivedi [11] and Agnihotri et al., (2013).

The progressive increase in number of branches (3.99) was recorded in T_4 Vermicompost 100% followed by (3.11) in T_6 Poultry manure 100% and the minimum number of branches were recorded in T_1 Control (2.55). The present findings corroborate with those of Athani et al., (2007), Naik and Babu [6], Ram et al., (2007), Ram and Pathak [7], Kumar et al., [8], Dutta et al., [9], Patel et al., (2009), Shukla et al., [10], Dwivedi [11] and Agnihotri et al., (2013).

The progressive increase in number of leaves (40.33) was recorded in T_4 Vermicompost 100% followed by (35.55) in T_7 FYM and the minimum number of leaves were recorded in T_1 Control (27.11). The present findings corroborate with those of Athani et al., (2007), Naik and Babu [6], Ram et al., (2007), Ram and Pathak [7], Kumar et al., [8], Dutta et al., [9], Patel et al., (2009), Shukla et al., [10], Dwivedi [11] andAgnihotri et al., (2013).

The progressive increase in stem girth (mm) (4.69mm) was recorded in T_6 Poultry manure 100% followed by (4.45mm) in T_4 Vermicompost 100% and the minimum was recorded in T_1 Control (3.63mm) The present findings corroborate with those of Athani et al., (2007), Naik and Babu [6], Ram et al., (2007), Ram and Pathak [7], Kumar et al., [8], Dutta et al., [9], Patel et al., (2009), Shukla et al., [10], Dwivedi [11] and Agnihotri *etal.,*(2013)

The maximum leaf area (124sq/cm) was recorded in T_4 Vermicompost 100% followed by (119.84sq/cm) in T_7 FYM and the minimum was recorded in T_1 Control (80.69sq/cm). The present findings corroborate with those of Athani et al., (2007), Naik and Babu [6], Ram et al., (2007), Ram and Pathak [7], Kumar et al., [8], Dutta et al., [9], Patel et al., (2009), Shukla et al., [10], Dwivedi [11] and Agnihotri et al., (2013). Akinboye et al., [12] Athani et al., [13] Baiyeri et al., [14].,

Table 1. Effects of different organic manures on the growth of passion fruit plant at different days after transplanting

Treatments		T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Treatment details		**Control (Coorg Purple)**	**Poultry manure (100%)**	**FYM (100%)**	**Vermicompost (100%)**	**Control (Coorg Yellow)**	**Poultry (100%)**	**FYM (100%)**	**Vermicompost (100%)**
Plant height	30 DAP	18.67	23.33	21.89	27.89	19.44	22.77	24.55	21.77
	60 DAP	24.19	35	34	40.55	32.55	37.66	37.33	32.88
	90 DAP	41.12	55.33	58.44	64.11	58.77	59.89	57	55.11
	120 DAP	61.57	79.11	78.33	89.77	77.33	82.22	78.11	76.78
No of leaves	30 DAP	0.55	1.89	2.33	1.77	2.22	2.11	1.88	1.44
	60 DAP	2	2.22	2.33	2.88	2.33	2.33	2.44	2
	90 DAP	2.44	2.66	2.77	3.77	2.66	3.22	2.88	2.22
	120 DAP	2.55	2.77	3	3.99	3	3.11	2.99	2.77
No o0f branches	30 DAP	5.99	6.55	6.55	9.11	6.11	7	7.89	6.44
	60 DAP	8.78	9.55	9.55	13.66	8.66	10.33	11.55	9.93
	90 DAP	14.11	14.44	15.55	21.11	13.88	16.66	18.22	15.11
	120 DAP	27.11	28.66	29.44	40.33	27.66	30.22	35.55	30.22
Stem girth	30 DAP	2.71	2.93	2.89	3.01	2.8	3.3	2.89	2.05
	60 DAP	2.77	3.26	3.29	3.44	3.22	3.67	3.32	3.2
	90 DAP	3.07	3.75	3.74	3.95	3.79	4.19	3.83	3.66
	120 DAP	3.63	4.25	4.26	4.45	4.28	4.69	4.01	4.2

Table 2. Effects of different organic manures on leaf area, chlorophyll content and survival per cent of a passion fruit plant

Treatment	Treatment combinations	leaf area(cm^2)	Chlorophyll content (µmol per m2)	Survival (%)
T_1	Control (Coorg purple)	80.69	75.67	66.67
T_2	Poultry manure (100%)	104.97	90.18	100.00
T_3	FYM (100%)	105.02	89.03	100.00
T_4	Vermicompost (100%)	124	92.39	100.00
T_5	Control (Coorg yellow)	100.84	71.74	100.00
T_6	Poultry (100%)	115.37	90.10	100.00
T_7	FYM (100%)	119.84	86.41	100.00
T_8	Vermicompost (100%)	103.54	77.81	100.00

Chadha et al., [15] Ani et al., [16] Kaushik et al., [17] Khattak et at., [18] Kiran et al., [19] Kumar et al., [20] Thokchom et al., [21] Rao et al., [22] Ray et al., [23] Singh et al., [24] Sushil et al., [25] Samson et al., [26] Shankar et al., [27] Dwivedi et al.,[28].

The highest chlorophyll content (92.39 sq/cm) was recorded in T_4 Vermicompost 100% followed by (90.10 sq/cm) in T_6 Poultry manure 100% and the minimum was recorded in T_5 Control (71.74sq/cm). This finding correlates the findings of Coronel et al., (2009) in Lettuce and Hokmalipour et al., (2012) in Maize.

The maximum survival (%) (100) was found in treatment with T4 Vermicompost (100%) followed by T8 Vermicompost (100%) ,T7 FYM (100%) , T6 Poultry manure (100%), T5 Control, ,T3 FYM (100%) and T2 Poultry manure (100%) and the minimum survival (%) (66.67) was recorded in T_1 Control.

4. CONCLUSION

Based on the study, it is determined that T4 Vermicompost 100% (Coorg Purple) performed best in terms of plant height (86.77cm), number of branches plant (3.99) , number of leaves plant (40.33), stem girth (4.69mm), leaf area (124 sq/cm) and Chlorophyll Content (92.39 µmol per m2) . The cost of establishment was found lowest in T1 (Rs 46,060 ha-1)

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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