

Influence of Organic Inputs on the Performance of Strawberry (*Fragaria x ananassa* Duch.) cv Festival

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ABSTRACT

An experiment was conducted to find out the effect of organic inputs on yield attributing characters and quality of strawberry cv. Festival was carried out in Garo Hills region of Meghalaya, India during 2022-2023 at Department of Horticulture, North-Eastern Hill University, Tura Campus in West Garo Hills District of Meghalaya. The experiment was laid out in Completely Randomized Design with eight different treatments which were replicated thrice. Treatment T₂ (vermicompost 250g/plant) was found to be superior over other treatments for parameters like number of shoots (6.67-11.00), number of leaves (9.33-26.00), leaf area (31.50 cm²-104.50 cm²), total numbers of runners (7.00) and yield parameters like number of fruit set (13.00), fruit set percentage (81.61%), fresh fruit weight (16.55g), fruit length × diameter (34.00 mm × 30.00 mm) and yield of the plant (495.26g). Whereas, T₁ (vermicompost 300g/plant) recorded the highest in number of flowers (2.66-4.00), duration

of flowering (107.00 days) and minimum days taken for flowering (43.00 days). Meanwhile, it was also recorded that T₂ (vermicompost 250g/plant) was found to have maximum total soluble solids (TSS) (10.47°Brix), total sugar (4.38%), reducing sugar (2.33%), non-reducing sugar (2.05%), titratable acidity (1.80%), ascorbic acid (16.46 mg/100g) and anthocyanin content (23.92 mg/100g). The overall findings indicate the potential of vermicompost (250g/plant) in organic production of strawberry.

Keywords Strawberry, Organic inputs, Yield, Quality.

INTRODUCTION

The strawberry (*Fragaria × ananassa* Duch.) is one of the most delicious and refreshing fruit of the world of family rosaceae and it is rich source of vitamins, minerals with excellent color, attractive appearance, pleasant flavor and aroma. The cultivated strawberry (*Fragaria × ananassa* Duch.) was originated from the hybridization of two American species viz., *Fragaria chilonensis* Duch. and *Fragaria virginiana* Duch. Nutritionally, strawberry is a low-calorie carbohydrate fruit but a rich source of vitamin A (60 IU/100g of edible portion), vitamin C (30-120 mg/100g of edible portion), fiber and also has high pectin content (0.55%) available in the form of calcium pectate.

The excessive use of synthetic fertilizers deteriorates the soil health, soil environment and also the human health. So, use of organic inputs can be

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a better option as organic inputs are natural products free of any pesticides and synthetic fertilizers, derived from naturally occurring plants, human and animal residues. Organic inputs like vermicompost, FYM, compost, bio fertilizers have been utilized in agriculture as a significant source of organic manure. These inputs help not only in bridging the existing wide gap between the nutrient removal and supply but also in insuring balanced nutrient proportion, by enhancing response efficiency, and maximizing crop productivity of desired quality (Soni *et al.* 2018). The application of organic inputs not only enhances soil physical properties and pH but also adds essential nutrients to the soil, thus increasing the supply of nutrients and their effective plant absorption (Hazrika *et al.* 2014). Uses of organic manures are environmentally safe and viable alternatives of chemical fertilizers and it increases microbial bio-mass in the soil. As a result, organic inputs are becoming more popular among the farmers.

MATERIALS AND METHODS

The present study was carried out during the year 2022-23 at the Department of Horticulture, North-Eastern Hill University, Tura Campus, Chasingre, West Garo Hills District, Meghalaya. The study was laid out in Complete Randomized Design (CRD) with three replications and consisted of 8 treatments namely T_0 : (control), T_1 : (FYM 300g/plant), T_2 : (vermicompost 250g/plant), T_3 : (poultry manure 150g/plant), T_4 : (wood ash 200g/plant), T_5 : (forest liters 250g/plant), T_6 : (PSB 2g/plant) and T_7 : (bone meal 100g/plant) were used to treat the plants in the present investigation. The above treatments were applied during the preparation of the potting mixture. Soil of 3kg was used to fill each polythene bag. Observations are recorded of plant characteristics in number of shoots per plant, number of leaves, leaf area (cm^2), days taken for flowering (days), Duration of flowering (days), number of flowers per plant, number of fruit set per plant, fruit set percentage (%), fruit yield (g), fruit weight (g), fruit size (mm), fruit color. Bio-chemical parameters were recorded in TSS ($^{\circ}\text{Brix}$), titratable acidity (%), total sugar (%), reducing sugar (%), ascorbic acid (mg/100g) and anthocyanin content (mg/100g).

Days taken for flowering and duration of flowering was recorded suggested by Kidmose *et al.* (1996). Number of flowers per plant and number of fruits set per plant was determine at 30 days interval. Fruit yield was recorded by total fruit production per plant and per plot. Fruit size was measured using vernier calliper, fruit weight was weighed on top pan electrical balance. TSS ($^{\circ}\text{Brix}$) was determined with the help of prima hand refractometer. Titratable acidity (%) was determined by titration of low weight of sample by titration with NaOH using phenolphthalein as indicator. Total sugar (%) and reducing sugar (%) was estimated using Lane and Eynon method (Rangana 1986). Ascorbic acid (mg/100g) and anthocyanin content (mg/100g) was estimated using volumetric method and spectrophotometer respectively. Statistical analysis was estimated by analysis of variance.

RESULTS AND DISCUSSION

Effect on yield attributing parameters

Significantly maximum number of runners (7.00), number of fruit set per plant (13.00), total fruit set percentage (81.61%), fruit length (34.00mm) and fruit diameter (30.0mm), fruit weight (16.55g), fruit yield per plant (495.26g) were recorded by the application of soil+ vermicompost (250g/plant) (Table 1). The probable reason for enhancement in the number of runners, number of fruit set per plant, fruit set percentage, fruit weight, fruit size and fruit yield may be attributed due to the essential elements, vitamins, enzymes and hormones present in vermicompost. And also due to their abundant concentration of exchangeable calcium, sodium, magnesium, potassium, phosphorus and molybdenum are higher in earthworm casts then in surrounding soil (Prasad *et al.* 2017).

It was observed that the soil application of FYM (300g/plant) gave significantly maximum total number of flowers (17.00), duration of flowering (107.00 days) and the minimum days taken (43.00 days) (Table 1). The data on the total number of flowers varies from 2.66 to 17.00 when treated with FYM (300g/plant). The minimum total number of flowers were observed in the control (9.33), whereas, minimum duration for flowering was recorded in PSB (2g/plant) treated plant (63.33 days) and the maximum

Table 1. Effect of organic inputs on yield attributing characters of strawberry.

Treatments	Total numbers of runners	Days taken for flowering	Duration of flowering (days)	Total number of flowers	Total numbers of fruit set	Total fruit set percentage (%)	Fruit size		Fruit weight (g)	Fruit yield per plant (g)
							Length (mm)	Diameter (mm)		
T ₀ -Control	3.66	88.66	71.33	9.33	7.00	75.62	15.66	18.33	5.47	79.37
T ₁ -Soil+FYM (300g/plant)	5.66	43.00	107.00	17.00	12.66	74.19	30.00	24.00	12.38	285.04
T ₂ -Soil+Vermicompost (250g/plant)	7.00	48.00	101.66	15.33	13.00	81.61	34.00	30.00	16.55	495.26
T ₃ -Soil+Poultry manure (150g/plant)	3.66	57.33	89.33	13.33	10.66	79.86	32.00	27.33	10.59	251.70
T ₄ -Soil+Wood ash (200g/plant)	5.00	71.00	79.00	15.00	11.66	78.20	27.00	23.66	8.18	214.14
T ₅ -Soil+Forest liters (250g/plant)	4.00	50.66	96.00	14.66	10.33	71.52	32.00	25.33	13.26	296.01
T ₆ -Soil+PSB (2g/plant)	4.33	86.66	63.33	11.33	8.00	71.66	18.33	21.33	7.73	80.14
T ₇ -Soil+Bone meal (100g/plant)	3.33	78.33	81.66	12.00	7.66	64.66	25.33	22.33	8.43	137.81
Mean	4.58	65.50	86.17	13.50	10.12	74.64	26.91	24.04	10.32	229.93
SEm±	0.48	1.52	1.33	1.11	0.85	3.28	2.33	0.73	0.15	36.33
CD (5%)	1.45	4.61	4.03	3.33	2.57	9.94	6.99	2.20	0.46	108.93
CV (%)	8.36	4.03	2.68	6.26	6.67	7.63	6.01	5.30	2.57	12.37

days taken for flowering was observed in untreated plants (88.66 days). The enhancement of total number of flowers, more duration in flowering and minimum days taken for flowering might be due to the macro and micronutrients required for plant growth mainly phosphorus, potassium, and nitrogen content in farmyard manure. In the present investigation highest yield was recorded in the plant applied with vermicompost (495.26 g per plant) which is in agreement with the findings of Cabilovski *et al.* (2023) where they reported that the strawberry plants applied with vermicompost led to a significant increase in strawberry yield.

Effect on quality parameter

From the study conducted, the bio-chemical characters such as Total Soluble Solids (TSS) (10.47°Brix),

total sugar (4.38%), reducing sugar (2.23%) and non-reducing sugar (2.05%) was seen highest in the plants treated with vermicompost (250g/plant). Fruits obtained from untreated plants recorded the minimum TSS (5.53°Brix), fruits obtained from forest liters (250g/plant) recorded the minimum total sugar (1.70%) whereas minimum reducing sugar content was found in poultry manure (150g/plant) and bone meal (100g/plant) treated fruits (1.32%) and non-reducing sugar content was found minimum (0.17%) in fruits treated with forest liters (250g/plant) (Table 2). The increase in the content of total soluble solids, total sugar, reducing sugar and non-reducing sugar of fruit might be due to the vermicompost application as it fastens the metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to the developing fruits. Also, the potassium (K) promotes sugar accumulation in

Table 2. Effect of organic inputs on quality of strawberry.

Treatments	TSS (°Brix)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Titrateable acidity (%)	Ascorbic acid (mg/100g)	Anthocyanin content (mg/100g)
T ₀ -Control	4.53	2.07	1.63	0.41	1.48	8.33	11.21
T ₁ -Soil+FYM (300g/plant)	5.66	1.79	1.42	0.34	1.48	11.20	15.47
T ₂ -Soil+Vermicompost (250g/plant)	10.47	4.38	2.23	2.05	1.80	16.46	23.92
T ₃ -Soil+Poultry manure (150g/plant)	9.86	1.76	1.32	0.41	0.42	9.86	12.52
T ₄ -Soil+Wood ash (200g/plant)	6.93	2.22	1.41	0.76	0.12	10.46	16.65
T ₅ -Soil+Forest liters (250g/plant)	8.60	1.70	1.52	0.17	1.76	12.30	22.48
T ₆ -Soil+PSB (2g/plant)	4.73	1.87	1.61	0.23	1.26	15.56	14.65
T ₇ -Soil+Bone meal (100g/plant)	4.60	2.10	1.32	0.74	0.72	9.20	18.64
Mean	6.92	2.24	1.56	0.64	1.13	11.67	16.94
SEm±	0.38	0.09	0.16	0.11	0.13	0.31	1.21
CD (5%)	1.16	0.29	0.35	0.34	0.41	0.94	3.64
CV (%)	9.74	7.62	7.01	4.98	4.88	6.99	10.42

berries and balance of N, P and K found essential for proper sugar accumulation of fruits, the increase in total sugars ultimately yielded higher sugars to acid ratio. These findings are in agreement with the results of Khalid *et al.* (2013).

Moreover, fruits obtained from the plants treated with vermicompost (250g/plant) witnessed the highest in titrateable acidity content (1.80%), ascorbic acid (16.46mg/100g) and anthocyanin content (23.92 mg/100g). Whereas, the minimum ascorbic acid content and anthocyanin content was observed in untreated fruits (8.33mg/100g and 11.21mg/100g), the minimum acidity content was recorded in wood ash (200g/plant), treated fruits (0.12%). Increase in ascorbic acid content might be due to the availability of micro and macro nutrients and increase in availability of phosphorus and secretion of growth promoting substances which accelerates the physiological process like carbohydrate synthesis.

CONCLUSION

From the results obtained during the investigation with different treatments of organic inputs on yield attributing characters and quality of strawberry cv Festival, it was concluded that the plants treated with vermicompost (250g/plant) was found to be

the best in terms of yield and quality parameters of strawberry. The treatment with vermicompost (250g/plant) highly influences the number of runners and it also influence the yield attributing parameters such as the number of flowers, number of fruit set per plant, fruit set percentage, fresh weight of fruit, fruit size (length x diameter) and yield of fruits per plant as compared to the untreated plants. Application of FYM (300g/plant) influenced the yield parameter viz., days taken for flowering and duration of flowering. The treatment with vermicompost (250g/plant) highly influences the quality parameters of strawberry i.e., total soluble solids, total sugar, reducing sugar, titrateable acidity and anthocyanin content as compared to the untreated plant. Application of forest liters (250g/plant) highly influenced the ascorbic acid content in strawberry. The overall findings indicate the potential of vermicompost (250g/plant) in organic production of strawberry.

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