

# Impact of Organic and Inorganic Fertilizer on Growth, Yield, and Quality of Strawberry

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## ABSTRACT

A field experiment was conducted to study the "Impact of organic manure and inorganic fertilizers on growth, flowering and quality of strawberry (*Fragaria ananassa* Duch.) cv. Camarosa" in the year 2021-2022 during rabi season. The experiment was conducted in Randomized Block Design (RBD), with 9 treatment and 3 replications. The treatments were T RDF- 100% NPK (control), T (FYM 75% + NPK 25%), T (Vermicompost 75% + NPK 25%), T (Poultry manure 75% + NPK 25%), T (FYM 50% + NPK 50%), T (Vermicompost 50% + NPK 50%), T (Poultry manure + NPK 50%), T (FYM 25% + NPK 75%), T (Vermicompost 25% + NPK 75%). From the above treatments and experiment conducted, it is found that treatment T (Vermicompost 25% + NPK 75%) was found best for all the parameters in Plant height, Number of leaves, Leaf area, Plant spread, Days taken for first flowering, Number of flower per plant, Days taken for first fruiting, No. of fruit per plant, Average per fruit weight, Fruit weight per plant, Fruit length, Fruit width, Total fruit yield, Total soluble solids, Acidity, Ascorbic acid. Also treatment T (Vermicompost 25% + NPK 75%) was found to be best and suitable in term of benefit cost ratio.

**Keywords:** Strawberry, NPK, Vermicompost, Poultry manure and FYM.

## Introduction

The cultivated Strawberry (*Fragaria x ananassa* Duch.) is one of the attractive, delicious, tasty and nutritious fruit and distinct and pleasant flavor. It has a unique place among cultivated berry fruits. *Fragaria* species belongs to family Rosaceae with basic chromosome number of x-7. The cultivated species (*Fragaria x ananassa* Duch) has chromosome number (2n) of 56. It is a monocious octoploid hybrid of two largely dioecious octoploid species, (*Fragaria chiloensis* and *Fragaria virginiana*). It is assumed the hybridization between *Fragaria chiloensis* and *Fragaria virginiana* had taken place spontaneously in Europe in early 17 century when female plant of *Fragaria chiloensis* of Chilean origin were grown in

proximity to female *Fragaria* plant of North American origin (Galletta and Bringhurst, 1990).

Strawberry can be grown in wide climatic conditions, ranging from temperate to tropical climate. Since its cultivation is greatly influenced by specific regional adaptation due to photoperiodic and temperature requirement, its cultural practices are highly variable. Among the different climatic factors, temperature and day length affect considerably the growth, plant morphology and yield (Pathak, 1970; Pathak and Singh, 1971).

Being rich in vitamin A (60 IU/100g), vitamin C (30-120 mg/100g), fibre, iron, pectin (0.55%) and ellagic acid, strawberry is mainly consumed as fresh fruit. However, it also contains very good amount of phenols, flavonoids, dietary glutathionine that too

exhibit a high level of antioxidant capacity against free radicals. Due to very high return per unit area and production of berries within few months of planting, the crop has gained economic importance throughout the world which ultimately increase the area and production of the crop to many folds over the past decades. However, due to shallow root system, large number of fruit production per unit area and sensitivity of the plants to nutritional balance, strawberry needs extensive use of mineral fertilizers as these mineral fertilizers play the fundamental role in determining growth, yield and quality of the fruit. But the inorganic forms of fertilizer are short in supply and very expensive too which ultimately increases the production cost up to 30% (Kumar *et al.*, 2019).

Therefore, this experiment aimed to assess the management of inorganic farming and Organic farming regime through FYM, Poultry manure, and urea on the growth habit of strawberry cv. Camarosa. Furthermore, fruit quality parameters (total soluble solids, titratable acidity, and pH) and health-promoting metabolites (anthocyanins, phenolics, flavonoids, and antioxidants) were also studied.

**Materials and Methods**

**Experimental site**

The present research entitled “Impact of organic manure and inorganic fertilizer on growth, flowering and quality of strawberry (*Fragaria ananassa* Duch.) cv. Camarosa” was carried out at the experiment field of the Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj during the period from November 2021 to March 2022.

The experiment was tested in RBD with 3 replications and consisted of nine treatments namely T0 (control) (RDF 100% + NPK), T1 (FYM 75%+NPK 25%), T2 (Vermicompost 75% +NPK 25%), T3 (POULTRY 75%+NPK 25%), T4 (FYM 50%+NPK 50%), T5 (Vermicompost 50%+NPK 50%), T6 (Poultry Manure 50%+ NPK 50%), T7 (FYM 25%+ NPK 75%), T8 (Vermicompost 25%+NPK 75%).

**Climatic condition**

The area of Prayagraj district comes under sub-tropical belt in the south east of Uttar Pradesh, which experiences extremely hot summer and fairly cold winter. The maximum temperature of the loca-

**Table 1.** Impact of organic and inorganic fertilizers of plant vegetative growth and fruit size.

Symbol	Treatment combination	Plant height						No. of leaves						Leaf area	Plant spread	Days to first flowering	No. of flowers per plant	Days of first fruiting per plant	No. of fruits per plant	Fruit length	Fruit width				
		30		60		90		120		30		60										90		120	
		DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT									DAT	DAT	DAT	DAT
T0	RDF 100% NPK (Control)	6.66	10.53	16.33	22.26	6.13	10.26	17.26	23.86	37.73	34.86	45.2	12.2	54.8	7.20	3.83	2.81								
T1	FYM 75% + NPK 25%	6.06	10.13	15.4	21.4	5.73	9.6	16.53	23.13	36.86	34.26	46.93	11.33	56.26	6.33	3.43	2.58								
T2	VERMICOMPOST75%+NPK 25%	6.93	11	16.86	23.06	6.2	11	18.26	25.06	39.26	35.46	44.66	12.93	53.46	7.93	3.57	3.13								
T3	POULTRY 75% + NPK 25%	5.66	9.73	15.26	20.53	5.33	9.26	16.06	22.46	35.8	33.93	48.06	10.06	57.6	5.06	3.37	2.50								
T4	FYM 50% + NPK 50%	7.13	11.26	17.33	23.6	6.4	11.73	18.8	26.26	40.46	37.46	44	13.86	52.73	8.86	4.18	3.41								
T5	VERMICOMPOST 50% + NPK 50%	7.66	13.06	19.6	25.73	6.73	13.2	20.8	29	42.13	40.46	42.26	15.46	49.6	10.46	4.47	3.93								
T6	POULTRY 50% + NPK 50%	7.40	11.93	18.06	25.06	6.46	12.13	20	27.93	41.06	39.2	42.86	14.6	50.53	9.60	4.87	3.59								
T7	FYM 25% + NPK 75%	8.06	13.66	20.53	27.06	7.06	13.93	21.46	30.26	44.26	42.66	41.93	16.13	48.93	11.13	5.32	4.25								
T8	VERMICOMPOST 25% + NPK 75%	8.40	14.26	21.73	28.33	7.13	14.46	23.06	32.33	46.8	44.53	40.26	17.66	47.13	12.40	5.51	4.39								
	F-test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S								
	S.Ed	0.64	1.35	1.21	1.97	0.81	1.24	1.72	1.98	2.65	2.22	2.04	1.39	2.00	1.33	0.05	0.05								
	CD at 5%	1.37	2.86	2.57	4.18	1.72	2.63	3.65	4.20	5.62	4.71	4.34	2.95	4.24	2.82	0.12	0.12								

tion reaches up to 46°C- 48°C and seldom falls down as low as 4°C- 5°C. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually.

Observations are recorded on plant height (cm), number of leaves, leaf area, plant spread, first flowering, fruit setting, TSS (°Brix), acidity (%), vitamin C (mg/100 g fruit).

## Results and Discussion

The results of the Impact of organic manure and inorganic fertilizer on different parameters have been critically studied and presented in Table 1 and 2. Character wise result have been scrutinized below :

### Growth Parameters

The growth of strawberry plant was significantly influenced by FYM, Poultry manure, Vermicompost, NPK.

Maximum plant height (28.33cm), number of leaves (32.33), leaf area(46.08cm<sup>2</sup>), plant spread (44.53cm), days taken for first flowering (40.26 days), first fruit setting (47.13 days), number of flower per plant (17.66), number of fruit per plant (12.40), fruit length (5.51cm), fruit width (4.39cm),

Vermicompost is the builder of protein and is the main constituent of protoplast in plants thus the increase in nitrogen supply accelerates synthesis of amino acids which might have indirectly exhibited increase in plant height of strawberry plant.

### Flowering parameters

#### Effect on fruit quality

The TSS, Acidity and Ascorbic acid were recorded



Fig. 1. Fully ripen strawberry fruits and some covered with paper bag.

highest by the application of Vermicompost 25%+NPK 75% in treatment T8 followed by treatment T7 (FYM 25%+NPK 75%).

Such as increase in T.S.S arisen due to synergetic effect of nitrogen due to vermicompost.

Maximum TSS (9.86) contents were recorded in the plants supplied with Vermicompost 25%+NPK

Table 2. Impact of organic and inorganic fertilizers of plant vegetative growth and fruit size.

Symbol	Treatment combination	T.S.S	Acidity	Ascorbic acid
T0	RDF 100% NPK (Control)	7.40	0.63	49.95
T1	FYM 75% + NPK 25%	7.23	0.64	49.61
T2	VERMICOMPOST75%+NPK 25%	8.03	0.61	50.75
T3	POULTRY 75% + NPK 25%	6.73	0.66	48.61
T4	FYM 50% + NPK 50%	8.56	0.60	51.81
T5	VERMICOMPOST 50% + NPK 50%	9.26	0.57	52.96
T6	POULTRY 50% + NPK 50%	8.93	0.58	52.51
T7	FYM 25% + NPK 75%	9.60	0.55	53.26
T8	VERMICOMPOST 25% + NPK 75%	9.86	0.54	54.92
	F-test	<b>S</b>	<b>S</b>	<b>S</b>
	S.Ed	0.58	0.034	1.84
	CD at 5%	1.23	0.072	3.91



75% in treatment T8. An increase in T.S.S with NPK and Vermicompost application might be due to quick metabolic transformation of starch and pectin into soluble compound and rapid translocation of sugars from leaves to the developing fruits.

The maximum acidity was found was found in treatment T3 (0.66) whereas the minimum acidity was found in T8 (0.54).

The maximum amount of ascorbic acid content was recorded in the treatment T8 (54.92 mg/100g). The respective increase in ascorbic acid content might be due to the increased efficiency of microbial inoculants to fix atmospheric nitrogen, increase in availability of phosphorous and secretion of growth promoting substances which accelerates the physiological process like carbohydrates synthesis etc.

## Conclusion

Use of organic manure and inorganic fertilizers not only enhance the quality of soil but also provide essential nutrients to the micro-organisms residing in the soil making it more fertile. The fruit quality and yield can be increased by using FYM, vermicompost and poultry manure which are all organic and do not harm in the soil in any way.

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