

Growth Yield and Quality of Vegetables under Chemical and Organic Farming

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Abstract

The experiment was carried out during winter season of 2012 to determine the effect of organic and chemical fertilizers on growth yield and quality of chilli(*Capsicum annum L.*) and brinjal (*Solanum melongena L.*). Three commercial organic fertilizers (Panchagavya, Sanjeevak, and Vardan)[4,5,6,7,8,9.] and one chemical fertilizer were used[3,4,5,6,7,8,9.]. In the final measurement both the two vegetables in organic fertilization treatments grew better and resulted in a final higher total yield, shoot length and branches than those in chemical fertilizer treatments[24,30], which was attributed to the high nutrient sustainability of organic fertilizer and the improved biological properties of the soil. Macronutrients contents Nitrogen (N), Phosphorous (P), Potassium (K) and Carbon (C) were increased by the application of organic manure. Total microbial count increases by using the organic fertilizers, shown the indication of healthy soil. Results of this experiment showed that chemical fertilizers were less suitable as compared to organic fertilizers. It is recommended that vegetables can be grown successfully with supplementation of organic fertilizers.

Keywords: Organic fertilizer, manure, yield, quality, soil properties, chilli(*Capsicum annum L.*) and brinjal (*Solanum melongena L.*).

INTRODUCTION:

The use of improved farm inputs such as chemical fertilizers, pesticides, improved seeds and farm machinery has been associated with a substantial increase in agricultural growth. It induces a productivity increase, which in turn facilitates a rise in farmer's income and overall economic growth. There has not been a significant improvement in the food situation in spite of several breakthroughs in the area of improved farm inputs. The reason has been attributed to low demand for and consumption of improved inputs in most developing countries. Most small-scale farmers still rely on crude inputs, land and

human labour with less use of chemical fertilizers and improved varieties of crops. Fertilizers application is a necessary condition for good yield of crop due to inherent low status of the soil. The use of fertilizer is reported to be responsible for over 50 percent yield increase in crops. However, the rising cost of chemical fertilizer has further focused attention on the cycling of plant nutrients through organic materials [16, 20]. Such observations across the globe have led to development of farming systems where input of chemical fertilizers have either been minimized or avoided.

It has been widely accepted that organic farming alone could serve as a holistic

approach towards achieving sustainable agriculture [2, 16], as it is nature based, environment friendly and ensures the conservation of resources for the future. Organic farming is quite distinct in the sense that it relies on closed nutrient cycles with less dependence on off-farm inputs. Vedic literatures (Vrikshayurveda) have clearly outlined a systematized agricultural practice [9], that insisted on the use of ‘Panchagavya’ – a mixture of the five products of cow in a specific ratio to enhance the biological efficiency of crop plants and the quality of fruits and vegetables[17,29,30,31,32]. For organic farming we employed certain mean formulation of liquid fertilizer like Panchagavya, Sanjeevak and Vardan to boost up growth of plant and compost to increase the fertility of soil [17, 25, 26,28,29,30,31,32].

The application of organic wastes combined with or without mineral fertilizer to soil is considered as a good management practices in any agricultural production system because it improves, plant quality and soil fertility [4, 5,6,7,8, 9,10,11, 16, 17, 18, 19, 26].

MATERIALS AND METHODS:

Vardan, is herbal product obtained from medicinal plant [21, 22, 25, 26]. It is used as a herbal organic manure. It is applied on the vegetable crops yield for increasing their physical parameters like height, leaves stem and fruit. As organic manure, plays important role in increasing yield and it does not cause any harm to plant. Vardan does not harm to environment i.e. considered as eco-friendly.

Sanjeevak is herbal fertilizers. It was prepared by mixing cow dung (10 Kg) and cow urine (10 litre) with jiggery (1Kg) and tapery(1 Kg)[5]. This mixture was allowed for fermentation for 10 days and then diluted to 200 litre of water.

Panchagavya is a herbal liquid fertilizer. It was prepared by mixing of cow dung (5 Kg) along with cow ghee (500 gms) in a container and it was stirred thoroughly twice daily for 3days. Ingredients like Cow urine (3 litre), Cow curd (250 ml), Cow milk (250 ml), Jaggery (1 gm), Banana (2pieces), Yeast powder (1 teaspoon) and Tender coconut water (250 ml) was supplemented on forth day and stirred twicely in a day for 15 days [5]. The growth parameters of brinjal and chilli such as plant height, branches and fruits were recorded after one week of application of fertilizer of prepared manure to the soil as per the following schematic table.

Table 1: Combination of Treatments

S.N.	Name of Treatments	
1.	Soil (Control)	Soil + Vardan
2.	Soil+ Panchagavya	Soil + Sanjeevak
3.	Soil + Chemical fertilizer	Soil (control)
4.	Soil + Sanjeevak	Soil + Panchagavya
5.	Soil + Vardan	Soil + Chemical fertilizer
6.	Soil+ Panchagavya	Soil + Sanjeevak
7.	Soil (control)	Soil + Vardan
8.	Soil + Chemical fertilizer	-----

The physicochemical parameters of soil such as N, P, K and organic carbon were estimated by following standard method [38]. The microbial analysis of soil was done twicely i.e. before as well as after application of such fertilizers using standard dilution plate count techniques [38].The analysis of soil was carried out to check the effectivity of carried out by estimation of chemical properties, determination of Nitrogen by Kjheldahal’s method[37]. Total phosphorus and potassium content was extracted by digestion with diacid and estimated the total

P calorimetrically as Vanado-molybdophosphophosphate yellow colour complex and K by using flame photometer. Total carbon content is determined as wet digestion method [12, 37].

Physical characteristics of soil:

1. Particle density.
2. Bulk density.
3. Water holding capacity.
4. Porosity.
5. pH.
6. Moisture.
7. Electrical Conductivity (EC).

RESULTS AND DISCUSSIONS:

In the observation table 2 and 3, I, II and III represent initial, incremented and final measurement. It was evident from table 2, and 3 that plants treated with Vardan showed optimum vegetative growth (shoot length) 37.75 cm in chilli, and 39.71 cm in brinjal. Originally, it was 10.63cm (chilli) and 13.64 cm (brinjal) at the time of planting [20]. Similarly plants treated with Sanjeevak (Soil application) also showed better vegetative growth in comparison with plants treated with chemical fertilizer [4,5,6,7,8,9,13,21] and plants treated with Panchagavya [17,25,26]. However, in our findings good and remarkable changes in various growth parameters were reported as compared to control and chemical fertilizers [32]. All liquid fertilizers shown more yield than chemical fertilizers. So, the liquid fertilizer may be completely replaced the chemical fertilizer [16].

Table2-Showing growth parameters of Brinjal.

S. N.	Treatment	Shoot length			Branches			Yield in gms.
		I	II	III	I	II	III	
1	Soil (Control)	20.1	24.5	27.8	0	4	6	390 gms
2	Soil + Panchagavya	22.3	35.8	29.3	0	7	10	430 gms
3	Soil + Sanjeevak	24.1	27.9	31.4	0	7	12	750 gms
4	Soil + Vardan	28.7	30.6	39.71	0	8	14	900 gms
5	Soil + Chemical fertilizer	22.3	24.8	30.1	0	5	8	450 gms

Table 3. Showing growth parameters of Chilli.

S. N.	Treatments	Shoot length			Branches			Yield in gms.
		I	II	III	I	II	III	
1	Soil (Control)	18.7	21.8	25.3	0	3	5	250 gms
2	Soil + Panchagavya	20.2	23.8	27.8	0	4	6	320 gms
3	Soil + Sanjeevak	22.3	26.67	31.5	0	4	8	560 gms
4	Soil + Vardan	27.2	32.5	37.75	0	4	10	710 gms
5	Soil + Chemical fertilizer	21.3	25.8	29.55	0	4	5	310 gms

Table 4: Physical analysis of soil.

S. N.	Treatments	Moisture %	Bulk density gm/cm ³	Practical density gm/cm ³	Porosity %	Water holding capacity %
1	Soil (Control)	6.54	1.20	2.50	80.00	61.85
2	Soil + Panchagavya	6.30	1.15	1.85	70.11	60.33
3	Soil + Sanjeevak	7.35	1.05	1.77	71.03	60.75
4	Soil + Vardan	7.25	1.03	1.81	78.86	60.63
5	Soil + Chemical fertilizer	7.57	1.44	2.38	65.00	58.83

Table 5: Physicochemical analysis of soil.

S. N.	Treatment	pH	EC
1	Soil (Control)	5.90	0.416
2	Soil + Panchagavya	5.60	0.410
3	Soil + Sanjeevak	5.23	0.350
4	Soil + Vardan	5.30	0.283
5	Soil + Chemical fertilizer	6.13	0.815

Table 6: Chemical analysis of soil.

S. N.	Treatment	N %	P %	K %	C %
1	Soil (Control)	0.0881	0.104	0.084	0.265
2	Soil + Panchagavya	0.061	0.096	0.52	0.296
3	Soil + Sanjeevak	0.06	0.021	0.061	0.338
4	Soil + Vardan	0.091	0.280	0.171	0.345
5	Soil + Chemical fertilizer	0.184	0.301	0.101	0.216

Data depicted in table 5, it was noticed that the highest pH 6.13 were found in soil + Chemical fertilizer treatment i.e. lies toward alkalinity when compared with other treatments where pH range was between 5.3 to 5.6. According to research study, alkalinity of soil effect on its micro-flora /bacterial population and that facilitates decrease in fertility of soil [1,21].

It was reported that from table – 6, the application of Vardan had also helped in the total nitrogen content of the soil, similar trend was observed in total phosphorous, potassium and carbon content of soil after harvesting the crops. These results prove that organic liquid manure application not only resulted in good yield but also added soil fertility.

It was again reported that from table 6, the highest microbial count i.e. 273×10^{10} and 42×10^4 was reported in treatment no. 4 in which soil nourished with Vardan, for bacteria and fungi respectively. On comparing all treatments, highest microflora was reported in treatments of liquid fertilizer added the soil than chemical fertilizer [4,5,6,7,8]. From the observations, it was reported that, the prepared liquid fertilizers/manures (Sanjeevak and Vardan) were best suited. Sanjeevak and Vardan gives more yield than Panchagavya.

Conclusion:

From the result and discussion, it was viewed that, liquid fertilizer helps to maintain the soil pH in favour of microbial count by increasing their number that facilitates the inorganic formulation from soil into the organic farming forms [1,4,5,6,7,8,23,24,29,30,31,32,33,34,35,36].

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