

Growth, yield attributes and yield of tomato (*Solanum lycopersicum L.*) as influenced by application of organic fertilization

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Abstract: *The organic field trial was conducted at Farm field, Department of Agriculture Engineering during rabi, 2017-18 to influence the organic source of nutrients on growth and productivity of tomato. Randomized Block Design (RBD) was implemented and replicated thrice of treatments for this experiment. The experiment consisted of six treatments viz., foliar spray of Panchagavya, 3G extract, Humic acid, gluconacetobactor and Neem oil. PKM 1 was used for test variety of this experiment. From the field investigation, foliar spray of panchagavya significantly improved the plant height, dry matter production, number of fruits per plant, fruit weight and yield per plant. However, all the growth and yield components were comparable to application of 3G extract spray. The fruit fly incidence was found to be significantly lower in the treatments that received 3G extract spray and it was comparable to treatments where in panchagavya spray was given. The disease incidence was significantly reduced in the treatments applied with panchagavya spray followed by 3G extract spray. From the study, basal application of 3 per cent panchagavya as foliar spray twice viz. before and after flowering is viable for the production of organic tomato with higher net return through higher yield.*

Key Words: 3G extract, Panchagavya, Dry matter production, yield, tomato

I. INTRODUCTION

Vegetable are highly produced by India in the world next to China, producing about 14.65 million tonnes of vegetables annually from an area of 8.495 million hectares [1]. Through the world, vegetables are play vital role for human health for give more nutrients, vitamins and mineral matters. The food scientists and diabetic doctors had analysed the food with high protein value, more vitamins, high minerals and very low calorific content. In India's, during green revolution the agriculture system of harnessing the synthetic fertilizers, chemicals and pesticides for increase the food production. Latterly, in this system goes to damage the soil fertility, agro ecology and bio diversity of crop plants. Overcome this problem, farmers are converted to use of inorganic fertilizers to organic sources for inputs to nature for the sustenance of human beings, similar to the presently defined organic farming.

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It is an agro-ecology management system which encouraged crop health, biological cycles, soil biological activities and biodiversity [2]. Nowadays, rapid population growth in India caused enormous food grains demand which led to used more chemicals, fertilizers and pesticides to enhance the production. Several gains in production during the last 3-4 decades resulted from the "Green Revolution," which highlight the technologies like expansion of irrigation, use of hybrids/transgenic varieties of crops, and synthetic chemical fertilizers and pesticides [3]. Unluckily, these affirmative developments have been conveyed by gradual and negative effects like salinity, develop insect resistance to pesticides, decreased soil fertility level and increased costs of production, which might be compete the sustainability of natural agricultural production at high levels [4]. Organic farming is the most important system to sustain the crop production, enhancing physical, chemical and biological properties of soil. To improve the quality of agricultural produce by application of various organic source of nutrients to reduce the crop failure and enhance the nutrient availability to the crops. The use of organic source of nutrients will reduce the chances of crop failure to a large extent and improve quality of agricultural produce. Hence, people are eagerly prepared organically grown produces for their flavour, nutritive value, taste, and extended shelf life [5]. Tomato is required more plant nutrients for their production. The natural farming is important for vegetables growers and consumers duo to their quality and also reduce the environmental pollution and maintaining the fertility of soil. Organic source of nutrient such as 3G extract, Panchagavya, Neem oil, Humic acid and other nutrients are used for organic cultivation instead of inorganic fertilizers to enhance the agro ecological system. Organic inputs contain more number of plant nutrients, growth promoters like enzymes and hormones, besides nutrients have improved soil fertility and productivity of crop [6]. However, very limited research attempts were made to develop using foliar spray of organic inputs on tomato. In view of the importance of organic tomato production, the present experiment has been taken with the following objective for the impact of organic fertilization on growth and yield of tomato.

II. MATERIALS AND METHODS

Field experiment was conducted at Farm field, Department of Agriculture Engineering, The experimental area of soil was sandy clay loam



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(*Typic Ustropept*) with neutral pH (7.2), low organic carbon (0.36) and 208 kg ha⁻¹ of low available nitrogen content, 18 kg ha⁻¹ of medium phosphorus content and high content of potassium (415 kg ha⁻¹). The treatment of various organic inputs as foliar spray of each @ 3G (ginger, garlic and green chillies) extract, 3 % of panchagavya, humic acid, gluconacetobacter, neem oil, and no spray (control) were adopted to Randomized Block Design (RBD) with three replication. Foliar sprays of all organic sources of nutrient were given at 30, 60 DAT (Days after transplanting) and harvest. PKM 1 variety was used in the organic field trial. Twenty five days old seedlings were transplanted to field with a spacing of 45 × 30 cm. The recommended packages of practices were uniformly followed in the field experiment. From the five tagged plots of each plot to record for growth, yield parameters and productivity of tomato and the collected data were analysed with five per cent probability level.

III. RESULTS AND DISCUSSION

A. Growth characters

Growth characters like plant height and dry matter production (DMP) were observed at 30, 60 and harvest stages of tomato and the results are presented here under.

Plant height is important parameter for indicating the vigour and growth of the every plants. In the present investigation, plant height and dry matter production was recorded at 30, 60 DAT and harvest presented in Table 1. The growth characters of tomato as plant height and dry matter production were statistically influenced by various organic input treatments. The taller plant and more dry matter production were observed by application of panchagavya spray @ 3 % at 30, 60 DAT and harvest respectively and it was on bar with 3G extract spray @ 3 %.

From the experiment, application of foliar spray of organic inputs increased the plant growth characters of tomato. It might have nutrients are availed with crop requirement through foliar spray of panchagavya for better development of tomato. The results are confirmed with findings of [7] in cassava, [8] in ashwagandha.

T. No	Treatment	Plant height (cm)			DMP (kg ha ⁻¹)		
		30	60	Har	30	60	Har.
		DA	DA		DA	DA	
T ₁	Foliar spray of Panchagavya @ 3 %	36.6	57.2	91.1	2258	3810	606
T ₂	Foliar spray of 3G extract @ 3 %	36.4	56.6	88.6	2167	3834	600
T ₃	Foliar spray of Humic acid	36.2	55.4	84.8	1874	3531	540
T ₄	Foliar spray of Neem oil @ 3 %	36.2	54.6	83.2	1818	3470	528
T ₅	Foliar spray of Gluconacetobacter	35.6	53.4	81.6	1801	3410	521
T ₆	Control (No foliar spray)	34.4	51.6	76.5	1474	3053	452
	SEd	0.68	1.07	1.60	87	158	207
	CD (P=0.05)	NS	2.26	2.65	184	337	424

Table 1. Effect of organic sources of nutrients on plant height (cm) and dry matter production (kg ha⁻¹) of tomato

3G extract: Ginger, Garlic and Green chillies extract, Har: Harvest

In control (no manure/ no spray) plot of plants are shorter and low dry matter due to not available the nutrients to the crops at important development stage. This might be due to insufficient supply of nutrients during growth period and this also observed by many authors [9] and [10].

B. Yield attributes and yield

The mean data on yield attributes of tomato viz., number of fruits plant⁻¹ and individual fruit weight are presented under (Table 2) along with fruit yield plant⁻¹ and fruit yield ha⁻¹ of tomato.

More number of fruits plant⁻¹ (50.9 fruits plant⁻¹), fruit weight (53.6 g), fruit yield (2.56 kg plant⁻¹), higher fruit yield (74.2 t ha⁻¹) were registered under panchagavya spray @ 3 % and followed by 3G extract spray @ 3 %. The control treatment was reported lower number of fruits plant⁻¹, fruit weight and fruit yield. Leaves are major sources for producing carbohydrates from photosynthetic activity it leads to increase the yield characters and yield of tomato crop [11]. While tomato crop required optimum number of leaves at growth stages and high dry matter production was increased the yield and yield characters due do better growth of crop from more numbers of leaves and high photosynthetic process to accumulate more photosynthates and enhanced the quantity and quality of tomato.

T. No	Treatment	No. of fruits plant ⁻¹	Fruit weight (g)	Yield plant ⁻¹ (kg)	Fruit yield (t ha ⁻¹)
T ₁	Foliar spray of Panchagavya @ 3 %	50.5	53.6	2.56	74.2
T ₂	Foliar spray of 3G extract @ 3 %	49.2	52.2	2.49	73.9
T ₃	Foliar spray of Humic acid	48.7	51.5	2.37	72.1
T ₄	Foliar spray of Neem oil @ 5 %	46.8	50.1	2.24	70.1
T ₅	Foliar spray of Gluconacetobacter	45.7	49.7	2.19	68.5
T ₆	Control (No foliar spray)	41.1	45.6	1.86	62.8
	SEd	0.91	1.01	0.048	1.50
	CD (P=0.05)	1.93	2.14	0.101	3.16

Table 2. Effect of organic sources of nutrients on yield attributes and yield of tomato

3G extract: Ginger, Garlic and Green chillies extract

Comparatively increased the more number of fruits and fruit weight due to enhanced growth parameters of dry matter production and more accumulation of carbohydrate in tomato crop. Similar to the present findings, the increase in fruit characters due to the application of organic sources of nutrient was reported by earlier workers like [12] and [13].

In experimental study, relatively control plot received the low yield attributes and yield due to less availability of nutrients at critical stages of crop to reduce the yield.

Less quantity of available nutrients could be reduce number of leaves, flower, fruits and fruit weight of crop was supported by [10].



IV. CONCLUSION

For the organic production of tomato experiment showed that three per cent panchagavya as foliar spray two times viz., before and after flowering has recorded maximum fruit yield and found to be viable with maximum net return, while sustaining fertility of soil and increase the profit which compared to farmer practices for cultivation of organic tomato.

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