Influence of Organic Manure on Morphological and Yield Attributes of Tomato *(Solanum Lycopersicum* L.) Plants

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Abstract-**The present study was carried to scrutinize the influence of organic manure by preparation of three different particle sizes of cyanopith and equal volume of Jiwamrita. The growth promoting efficacy of *Solanum lycopersicum* L. (Tomato) as an experimental crop was also carried out. Results revealed that the minimum particle size (0.01-0.1mm) of organic manure induces morphological parameters such as shoot length, shoot width, number of leaves, number of branches, number of flowers, shoot fresh and dry weight, root fresh and dry weight, and also gave good yield of tomato (*Solanum lycopersicum* L.) plant as compared to that of other particle sizes and control.**

Key words- Coir pith; Cyanobacteria; Cyanopith; Jiwamrita; Organic manure; Tomato

I. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is a major vegetable crop that has achieved incredible popularity over the last century. Tomato fruit contains significant amount of lycopene, β – carotene, magnesium, iron, phosphorus, potassium, riboflavin, niacin, sodium and thiamine [1]. It has anti-oxidant properties and potential beneficial health effects.

Almost any kind of organic matter may be used as manure, but some kinds are better than others. The beneficial effect of organic manure in agricultural production and soil fertility are known from many decades but they are inadequate in nutrient supply and low in nutrient concentration. Organic manures which breakdown or decay quickly is available to the plant faster than those which decay slowly [2].

Jiwamrita is a plant growth promoting substance containing beneficial microorganisms that provides the necessary nutritional requirement for growth and yield of crop [3]. The use of jiwamrita treated organisms, improves the physical, chemical and biological properties of soil, besides improving the efficiency of applied manure [4].

Cyanobacteria are in distinct position to degrade various organic pollutants using heir lignolytic enzymes, because of their simple nutrient requirement and flexibility to survive in various environmental conditions. Cyanopith is an organic fertilizer produced by biodegradation of coir pith using freshwater cyanobacterium, *Oscillatoria annae* [5].Coir pith degradation by *Ocillatoria annae* is a partial degradation [6]. Hence, the present study aims to convert the partially degraded coir pith into three different particle sizes of organic manure and these have been enriched with jiwamrita. Analysis of growth promoting efficiency and yield of tomato plants were also carried out.

II. MATERIALS AND METHODS

A fresh water cyanobacterial strain, *Oscillatoria annae* was obtained and grown in BG11 Medium [7] under white fluorescent light of 1500 lux with 10/14 hrs L/D cycle at 25 ± 2ºc.

Cyanopith fertilizer [5]

The coir pith based cyanobacterial product is known as cyanopith and this is used as a basal fertilizer.

Preparation of organic manure:

The cyanopith fertilizer was taken, sieved and ground into three different particle sizes (a- 1-2cm; b- 0.1-1mm; c- 0.01- 0.1mm). 1kg of each sizes of cyanopith was taken in separate tank and 1 L of jiwamrita was added and mixed well. This was kept for composting under shadow for 30 days.

Pot Experiment:

Tomato (*Solanum lycopersicum* L.) plant was treated with three different particle sizes of organic manure. It was applied two days intervals (5g/pot). There were 9 sets of pots in each treatment and without application of organic manure was considered as control and all the pots were watered regularly. Various growth parameters such as shoot length, shoot width, No. of leaves, No. of Flowers, No. of Fruits, plant fresh and dry weight, root fresh and dry weight were estimated. The data were subjected to one way analysis of variance (ANOVA) with SPSS version 16.0 by using Duncan's test at $p<0.05$ level of significance.

III. RESULTS AND DISCUSSION

Analysis of Morphological and yield parameters in tomato (Solanum lycopersicum) plants

The effect of three different particle sizes of organic manure on the growth performance of tomato (*Solanum lycopersicum* L.) was determined based on morphological parameters such as shoot length, shoot width, number of branches, number of leaves, number of flowers, shoot fresh weight, shoot dry weight, root fresh weight, root dry weight and yield.

In this pot experiment, application of three different particle sizes of organic manure showed significant effect on all morphological characteristics features when compared to control (Fig.1-3). There is no variation in 1-2cm particle size applied plants when compared to control plants. However, moderately increase in other particle sizes of manure compared to maximum size and control. Maximum shoot fresh and dry weight, root fresh and dry weight was observed in minimum particle sizes when compared to all other treatments (Fig.4). Surprisingly, approximately one fold increased yield was taken in minimum particle sizes when compared to other particle sizes and control (Fig.5).

Significantly, increase in all parameters such as morphological, weight and yield in minimum particle size of organic manure when compared to maximum and medium particle sizes. Release of nutrients in minimum particle sizes due to easily degradation by microorganisms could be the reason for the better growth and yield of tomato plant when compared to control and other treatments. Application of maximum and medium particle size of organic manure showed normal growth and yield when compared to minimum particle sizes. Though these two fertilizers contain cyanopith and jiwamrita take more time to degrade because of the sizes (1-2cm &0.1-1mm) when compared to 0.1-0.01mm particle size.

The application of coir pith based cyanobacterial biofertilizers cyanopith (100g) and cyanospray (0.4%) increased significantly the morphological and yield characters of *Aloe barbadensis* Miller than the control [8]. The combined application of basal (25g) with foliar spray (0.4%) of cyanopith biofertilizer significantly increased the morphological, biochemical and yield of *Zea mays* when compared to control [9]. Results revealed that the significant improvement in both morphometric and yield parameters in the *Helianthus annuus* L. (sunflower) plants treated with coir pith based cyanobacterial biofertilizer than that of control and chemical fertilizer treated plants [10].

Supporting evidences showed that significant increase in means stem diameter and mean height of tomato plant was observed by the addition of different concentration of sheep manure vermicompost in soil [11]. Significant increase was observed in number of leaves and no. of fruits/plant in three vermicompost treatments as compared to control [12]. The application of nitrogen fertilizer (30kg/ha) at two week intervals produced significantly higher total and marketable yield and vegetative growth of tomato when compared to 1 and 4 week, intervals treatments [13].

Root dry weight and root length increased significantly in plants of the *Bacillus subtilis* 13 (BS13) treatment compared to control treatments [14]. The vermicompost applied at rate of 40t/ha produced tomato yields 192 t/ha compared to 56t/ha for inorganically fertilized tomatoes [15]. Significantly, the addition of vermicompost at the rate of 15 t/ha increased growth and yield of tomato compared to control [16]. The tomato yields in field soils amended with municipal solid waste compost were significantly greater than the untreated plots [17].

IV. **CONCLUSION**

The present study deals about the three different particle sizes of organic manure (cyanopith mixed with jiwamrita) and it was incubated for 30 days. During incubation, the enhanced nutrient level was observed in organic manure such as pH, EC, NPK due to the activity of microbes present in jiwamrita. Then, it was applied to the experimental crop (*Solanum lycopersicum*). The growth and yield parameters were increased by the addition of three different particle sizes of organic manure as compared to the control. Hence, this study concluded that the minimum particle size (0.01-0.1mm) of organic manure has enriched nutrient status, as well as induce the plant growth and gives good yield of tomato (*Solanum lycopersicum*) plant as compared to that of other particle sizes and control.

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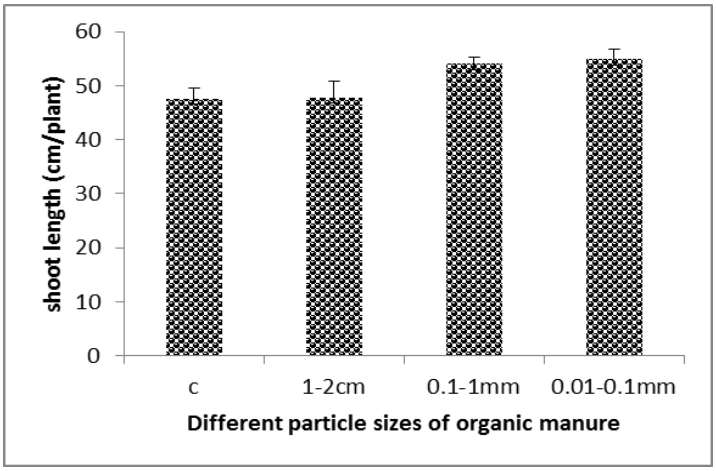

Fig.1. Effect of organic manure on Shoot length of *Solanum lycopersicum* on 60th day after transplant

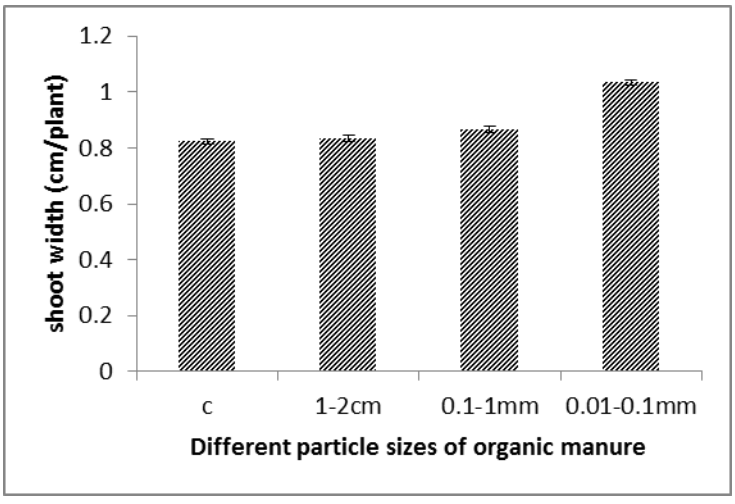

Fig.2. Effect of organic manure on shoot width of *Solanum lycopersicum* on 60th day after transplant

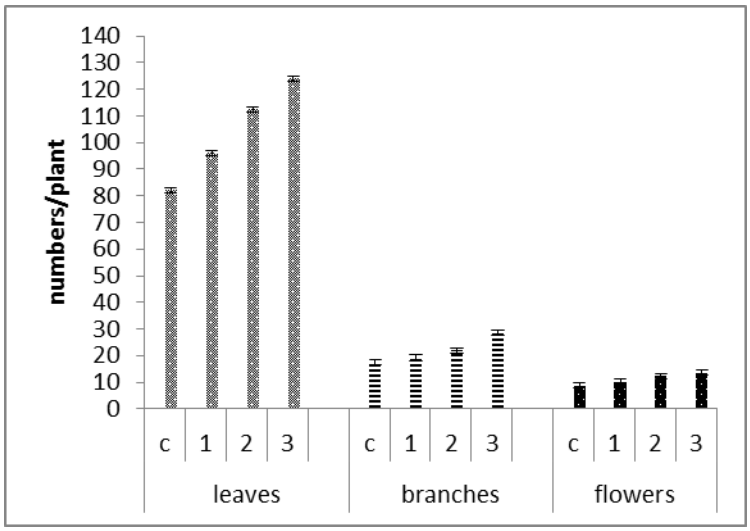

Fig. 3. Effect of organic manure on no. of leaves, branches, flowers of *Solanum lycopersicum* on 60th day after transplant

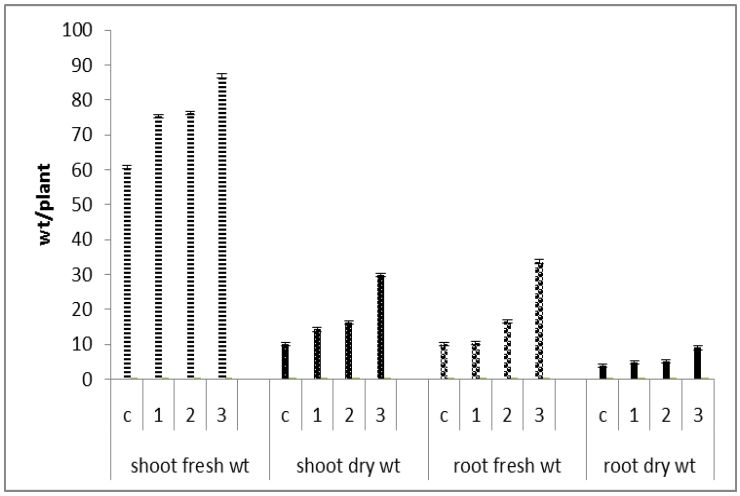

Fig. 4. Effect of organic manures on shoot & root fresh and dry weight of *Solanum lycopersicum* on 60th day after transplant

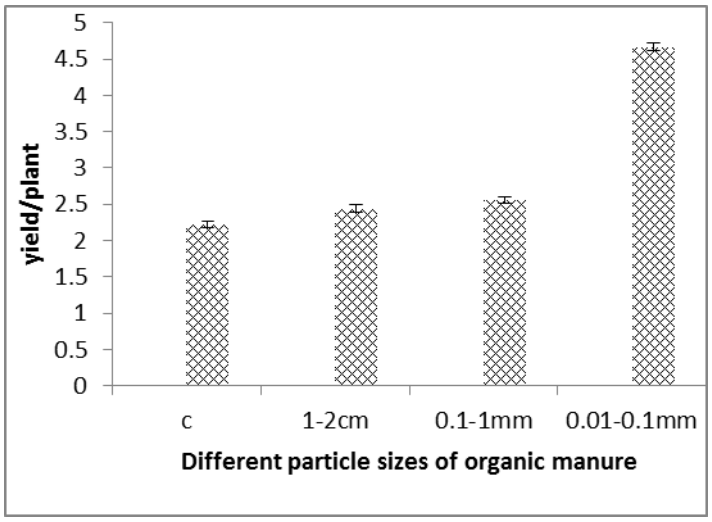

Fig.5. Effect of organic manure on yield of *Solanum lycopersicum* on 60th day after transplant