



The influence of vermicompost on the growth and yield of *Hibiscus esculentus*

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ABSTRACT

The experiment was conducted to evaluate the effect of vermicompost and urea on the growth and yield of the vegetable plant, *Hibiscus esculentus*. *Hibiscus esculentus* is allowed to grow in the medium of vermicompost and urea. Three were 3 treatment viz., control, vermicompost (T1) and urea (T2). Observation was made from 10 randomly selected plants per pot. The effect of the organic fertilizer (vermicompost) and inorganic fertilizer (urea) on the growth and yield of the *Hibiscus esculentus* were studied. The germination percentage, shoot length and yield of the plant were recorded on 20th, 40th and 60th days. The present study revealed that vermicompost seems to be maintained the soil which is ideal for growth of the plant. The highest yield of *Hibiscus esculentus* was found in vermicompost treatment (T-1) followed by urea (T-2) and lowest in control. Application of vermicompost increased the vegetative growth and yield of *Hibiscus esculentus*.

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Introduction

Vermicomposts are products derived from the accelerated biological degradation of organic wastes by earthworms and microorganisms. Earthworms consume and fragment the organic wastes into finer particles by passing them through a grinding gizzard and derive their nourishment from microorganisms that grow upon them. The compost produced from organic wastes by the action of earth worm is tested as the media for the stimulation of rooting, time of flowering and lengthening of inter nodes (Tomati, 1983).

Adding earthworm casts to soil can improve its structure and fertility greatly (Lunt and Jacobson, 1944). Vermicompost is made up primarily of C, H and O, and contains nutrients such as NO₃, PO₄, Ca, K, Mg, S and micronutrients which exhibit similar effects on plant growth and yield as inorganic fertilizers applied to soil (Singh *et al.*, 2008). Vermicompost an organic source of plant nutrients contains a higher percentage of nutrients necessary for plant growth in readily available forms (Nagavallema *et al.*, 2004). Vermicompost plays a major role in improving growth and yield of different field crops, including vegetables, flowers and fruit crops. In a study involving a wide range of vegetable and ornamental seedlings, result showed earlier and better germination in a vermi compost compared with control (Edwards and Burrows, 1998; Gutierrez-Miceli *et al.*, 2007).

Vadiraj *et al.* (1998) reported that application of vermi compost produced herbage yields of coriander cultivars that were comparable to those obtained with chemical fertilizers. The soil enriched with vermi compost provides additional substances that are not found in chemical fertilizers (Kale, 1988). Vermicomposts produced commercially from cattle manure, food waste or recycled paper, were applied to field plots compared with those receiving equivalent amounts of inorganic fertilizer. (Alam *et al.*, 2007) on the effect of vermicompost and N, P, K and S fertilizers on the growth and yield of red amaranth (*Amaranthus cruentus*), showed that chemical fertilizers were more efficient in the first four weeks of application suggesting

that the vermicompost may have taken at least four weeks to have a more favorable effect on plant growth.

Baldatto *et al.* (2009) established significant accumulation of N, P, K, Ca and Mg in the roots shoots and leaves as a result of the application of humic acids derived from vermicompost. Golchin *et al.* (2006) reported that vermicomposted animal manures tend to have a higher nutritional status, compared with that derived from organic municipal waste. Vermicompost produced from cattle and pigs manure as well as food wastes increased the rate of germination, growth and flowering of a range of ornamental and vegetable seedlings compared with vermicompost from other sources (Atiyeh *et al.*, 2002a).

Materials and Methods

The effect of vermicompost application on the Germination percentage, Shoot length of and total Yield of *Hibiscus esculentus* was carried out through pot experiment.

There were 3 treatments viz., control, vermicompost and urea. About nine pots were taken and each pot was filled with 5 kg of red soil. Out of the nine pots, three pots were used for control; three pots were used for an organic fertilizers, (Vermicompost) treatment and remaining three pots were used for inorganic fertilizers (urea) treatment. Sufficient moisture was maintained by adding water. The manure was added once in 20 days and the experiment was carried out for 60 days. (Gowtam kumar Chanda *et al.*, 2011). Three replications were maintained for each treatment.

F1-hybrid of *Hibiscus esculentus* seeds variety were purchased from local market at Tirunelveli and were used in this experiment. A total of 10 *Hibiscus esculentus* seeds with spacing of 3cm were sown at a depth of 3cm in each pot. Hence, a total of 90 seeds were sown in a 9 pots of each treatment. Germination percentage was determined in each of the three treatments after 20 days. The germination percentage of plants were calculated on 5th, 10th and 15th days.

$$\% \text{ of germination} = \frac{\text{No of seed germinated}}{\text{Total no of seeds}} \times 100$$

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Various growth and yield parameters like average height of the plant, average number of flowers, and yield, were recorded based on 10 plants randomly selected from each pot once in three days from 3 to 60 days. The average shoot length was calculated on 20th, 40th and 60th days calculated on the respective days. The average plant height was recorded using scale. The yields of vegetables in plants were measured by the size and weight.

Results and Discussion

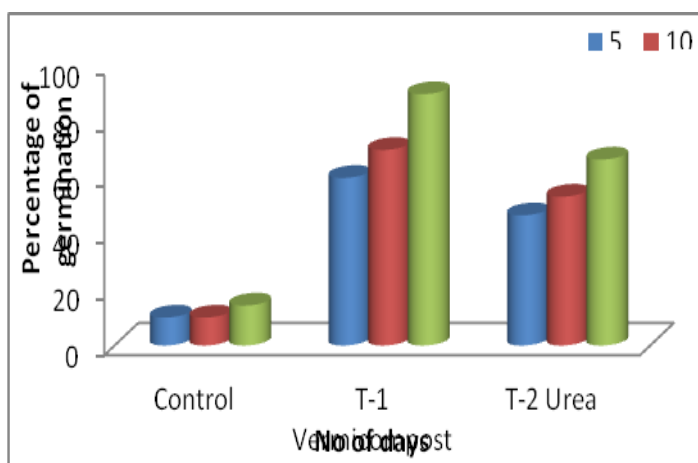
Plant growth was significantly influenced by application of vermicompost, urea compared to control. The average plant height, the percentage of germination and number of flowers and average yield increased as the levels of organic and inorganic fertilizers application increased.

The germination percentage was observed On 5th, 10th and 15th days, in control treatment 1 and treatment 2. On 5th day, the germination percentage of *Hibiscus esculentus* in Control and experiment 1 and 2 it was noted as 10%, 70%, and 53.3% respectively. On 10th day, the germination percentage was noted as 14.3%, 90% and 66.6% respectively. On 15th day, the germination percentage of *Hibiscus esculentus* in control and experiment 1 and 2 it was noted as 20%, 90%, and 66.6% respectively.

The present study stated that the germination percentage was higher in vermi compost treatment when compared to urea and control. (Fig 1). The higher percentage of germination were significantly improved by the sole application of vermicompost fertilizers. Fig.1 is a clear evidence to support that the Vermicompost medium promote and enhanced the germination process of the *Hibiscus esculentus*.

The application of vermicompost gave higher germination of mung bean (*Vigna radiata*) compared to the control. The growth and yield of mung bean was also significantly higher with vermicompost application (Karmegam et al., 1999). The increases in growth, flowering and crop yields are due to earthworms as they increase microbial populations that produce plant growth hormones (Paterson, 2003).

Fig.1. Germination percentage of *Hibiscus esculentus* treated with vermicompost and urea



The plant height is the major important yield contributing parameter of *Hibiscus esculentus*. In this present study in the shoot length of the *Hibiscus esculentus* was, measured on 20th, 40th and 60th days in control, Treatment 1 and Treatment 2. The plant height ranged from 5.30±2.85cm recorded in the control (11.06±2.40 cm) treatment 1, and 7.26±2.21 cm recorded in treatment 2, was observed on 20th day. On 60th day, the plant

height was observed in control (12.76±3.34cm), in treatment 1, (19.83±2.87 cm), and treatment 2, (16.56±2.74 cm) (Table 1). In this present study, application of vermicompost alone recorded higher shoot length, over the control. The plant height was increased significantly due to the application of vermicompost and inorganic fertilizer.

The amount of vermicompost had a significant effect on not only growth and flowering of the Marigold plants, but also on the plant shoot and root biomass, plant height and diameter of the flowers (Pritam et al., 2010). Senthilkumar et al. (2004) found that vermicompost with NPK fertilizers significantly enhanced Rose sp growth, yield and quality over them control, especially when used in combination..

The yield of the vegetables assessed in the following pattern and presented in different units like total number of vegetables, average weight of vegetables (gm), average length (cm), number of harvest and self life of vegetables are presented Table 3. In control, the total weight of the vegetables of *Hibiscus esculentus* was observed as 28 (gm). In treatment 1, it was observed as 185 (gm), whereas in treatment 2, it was observed as 49.6 (gm) respectively.

The average weight of the vegetables was higher in vermicompost treatment (10.3gm) than urea treatment (8.25gm) over control (7gm). The average length of vegetables was noted in vermicompost treatment 12.31cm, in urea treatment 10.25cm, over control 10.72cm.

The number of flowering, the number of harvesting and self life of vegetables in *Hibiscus esculentus* was higher in vermicompost than urea treatment and control.

The data represented Table 3 show that the plant grow in vermicompost has given maximum yield. In addition the number of harvesting have been increased. The yield of pea (*Pisum sativum* L.) was higher with the application of vermicompost at a rate of 10 tha-1 along with recommended N, P and K compared with when these fertilizers were applied alone (Reddy et al., 1998). The application of different levels of vermicompost to (*Chrysanthemum chinensis*) resulted increased fresh weight of flowers, number of flowers per plant, flower diameter and yield with the application of vermicompost (Nenthra et al., 1999). Vermicompost application have also been reported to significantly increase yield of tomato (*L. esculentum* L.) in farmer's fields compared with control (Nagavallemma et al., 2004).

It was also reported that soil amended with 30% Vermicompost produced the most flowers on the Marigold (*Tagetes erecta* L.). Plants in pot culture experiments, and the largest flower diameter was produced in soil amended with 40% vermi compost (Pritam et al., 2010). Vermicomposts applied soils together with of the recommended rate of inorganic fertilizers increased yields of okra (*Abelmoschus esculentus* Moench) significantly (Ushakumari et al., 1999).

It is also suggested that vermicompost is more favourable for better yield of *Hibiscus esculentus* plant and maintenance of soil environment and it can be economically and also environmentally suitable. The effect of vermicompost on the growth and yield significance when compared to control. Marketing vermicompost is know potential and flourishing Industry due to the growing awareness among the people about the ill effect of chemical fertilizer and the relative benefit of organic farming. The utilization of vermicompost results in several benefits to farmers, industries, environment and overall national economy

Edwards and Burrows (1988) reported that vermicomposts increased ornamental seedling emergence compared with those in control commercial plant growth media, using a wide range of test plants such as pea, lettuce, wheat, cabbage, tomato and radish.

Table 1. Effect of Vermicompost on the average Shoot Length (cm) of *Hibiscus esculentus*

| Treatment | Shoot length (cm) | | |
|------------------|-------------------|------------|------------|
| | Days | | |
| | 20 | 40 | 60 |
| Control | 5.30±2.85 | 8.53±2.59 | 12.16±3.34 |
| T-1 Vermicompost | 11.96±2.40 | 16.03±2.72 | 19.83±2.87 |
| T-2 Urea | 7.26±2.21 | 8.93±2.69 | 16.56±2.74 |

Table 2. Effect of vermicompost on flowering of *Hibiscus esculentus*

| Treatment | No.of.flowering | | |
|------------------|----------------------|----------------------|----------------------|
| | Days | | |
| | 30 th Day | 35 th Day | 40 th Day |
| Control | 2±0.57 | 6.33±2.60 | 9.66±2.02 |
| T-1 Vermicompost | 3.6±0.57 | 11±0.02 | 21.3±0.36 |
| T-2 Urea | 3.66±0.88 | 9.66±2.02 | 19±2.32 |

The mean differences is significant of the $p < 0.05$ level

Table 3. Comparative data of the yield in *Hibiscus esculentus*

| Treatment | Total no of Vegetables | Total Weight (gm) | Average Weight (gm) | Total Length (cm) | Average Length (cm) | No of harvesting | Self life of vegetables |
|------------------|------------------------|-------------------|---------------------|-------------------|---------------------|------------------|-------------------------|
| Control | 4 | 28 | 7 | 42.9 | 10.72 | 2 | 8 |
| T-1 Vermicompost | 15 | 185 | 10.3 | 184.7 | 12.31 | 3 | 18 |
| T-2 Urea | 6 | 49.6 | 8.25 | 61.5 | 10.25 | 2 | 14 |

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