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# STUDY THE COMPARATIVE EFFECT OF BIOFERTILIZERS AND CHEMICAL FERTILIZERS ON PHYTOCHEMICALS OF BRINJAL (*SOLANUM MELONGUM* L)

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## ABSTRACT

*Solanum melongum* L. is an important vegetable crop and widely grown in India. One of the major causes of low yield may be that the organic matter content as well as nutrient status of soils have declined over time. In the present study, evaluate the comparative effect of organic fertilizer and chemical fertilizer on phytochemical of *Solanum melongum* L. The results of the phytochemical analysis indicates that the vermicompost enhance the quality and quantity of chemical constitute such as tannins, flavonoids, carbohydrates, proteins steroid, phenols and alkaloids, whereas all important phytochemicals were absent in plant cultivate under chemical fertilizer and control condition. The result indicates that application of vermicompost can enhance the growth parameter, nutritional content, phytochemicals and antioxidant activity of *Solanum melongena*. Therefore, it is concluded that vermicompost can be recommended for better growth and enhancement of phytochemicals in agricultural practices.

**KEYWORDS:** *Solanum melongum, Total Phenol, Total flavonoid, Vermicompost.*

## INTRODUCTION

Egg plant, *Solanum melongena* L. also known as Aubergine in Europe, Brinjal in India, is one of the non-tuberous species of the nightshade family *Solanaceae*. It has lots of verity that shows a wide range of fruit shapes and colours, ranging from white, yellow, green through degrees of purple pigmentation to almost black (Gandhi and Sundari, 2012). Brinjal (*Solanum melongum* L.) is an important vegetable crop and widely grown in India. Unfortunately, its yield is low (Thamburaj and Singh 2001). One of the major causes of low yield may be that the organic matter content as well as nutrient status of soils have declined over time (Sat Pal Sharma and J. S. Brar, 2008). As agriculture technologies develop and becomes more intensive in its use of land and water resources in order to increase food production to meet the nutritional demand of vast growing population, its negative impacts on agricultural eco-systems was become more destructive (Shaheen et al., 2016). Bio-fertilizer as an organic agro-input can promotes plant growth by increasing the supply or availability of macro and micro nutrients through the natural processes (Mohsen et al., 2014). Plant nutrition is one of the most important factors affecting quantity and quality of secondary metabolites in plants. M.S. Ullah et al., 2008 reported the effects of organic manures and chemical fertilizers on the yield of brinjal and soil properties. They found that the organic matter content and availability of N, P, K and S in soil were increased plant growth and yield. Production of secondary metabolites is influenced by different factors, soil conditions, soil nitrogen and antioxidants (Rachel and Gandreddi Sirisha, 2016).Bio-fertilizers add nutrients through the natural processes of nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances (Kapoor et al., 2015). The present investigation was undertaken to study the effect of bio-fertilizers and chemical fertilizers on phytochemicals of brinjal crop.

## MATERIALS AND METHODS

To study the effect of vermicompost and chemical fertilizer on brinjal, certified and healthy seeds were collected from the local market of Bhopal. Three treatments with three replicates was prepared (T1- Control soil without bio-fertilizer, T2- Soil with Vermicompost in 1:1 T3- Soil with chemical fertilizers (Urea @ 5% and DAP @20%). After seedlings of *Solanum melongena* were transplanted into pots of equal size 20 cm in height and 6 cm in dm. The pots were provided with water facilities. The pots were maintained in the open shade at the temperature of 27°C - 30°C. After noe month of growth some plants were removed from all samples and studied for the quality and quantity of phytochemical.

### Phytochemical analysis

Qualitative estimation of phytochemicals was carried out with the methods by Singh et al., 2012. Carbohydrate, Proteins, alkaloids, flavonoids, phenols, saponins and fixed oil were determined.

**Determination Total Flavonoid Content**

The total flavonoid content (TFC) of the extract was determined using the aluminium chloride assay through Spectrophotometer (Samatha *et al.*, 2012). An aliquot (0.5 ml) of extract was taken in different test tubes, then 2ml of distilled water was added, followed by the addition of 0.15 ml of sodium nitrite (5% $NaNO_2$, w/v) and allowed to stand for 6 min. Later 0.15 ml of aluminium trichloride (10% $AlCl_3$) was added and incubated for 6 min, followed by the addition of 2 ml of sodium hydroxide (NaOH, 4% w/v) and volume was made upto the 5ml with distilled water. After 15 min. of incubation the mixture turns to pink whose absorbance was measured at 510 nm using a spectrophotometer. Distilled water was used as blank. The TFC was expressed in mg of quercetin equivalents (QE) per gram of extract. All the determinations were carried out three times.

**Determination of Total Phenolic Content**

The total phenolic content (TPC) of the *Solanum melongena* plant were determined using the method of Singleton *et al.*, (1999) with slight modifications. To 0.5 ml of test sample, 1.5 ml (1:10 v/v diluted with distilled water) Folin Ciocalteau reagent was added and allowed to stand for 5 min. After 5 min, 2.0ml of 7.5% of sodium carbonate was added. These mixtures were incubated for 90 min. in the dark with intermittent shaking. After incubation, development of the blue colour was observed. Finally absorbance of blue colour in different samples was measured at 725 nm using spectrophotometer. The phenolic content was calculated as Tannic acid equivalents TA/g on the basis of standard curve of Tannic acid. The results were expressed as tannic acid equivalents TA/g of the plant material. All the determinations were carried out in triplicates.

**RESULTS AND DISCUSSION**

Table 1 shows the comparative effect of organic fertilizer and chemical fertilizer on the phytochemicals of *Solanum melongena* crop. The organic manures profoundly influenced the presence of phytochemicals. Many researchers have reported the effect of vermicompost on growth and yield of Solanum melongena (Sinha et al., 2013; Ahirwar and Hussain, 2015), but no one focused on the evaluation of phytochemicals. The results of the phytochemical analysis are shown in Table1 indicates that the vermicompost enhance chemical constitute such as tannins, flavonoids, carbohydrates, proteins steroid, phenols and alkaloids, whereas all important phytochemicals were absent in plant cultivate under chemical fertilizer and control condition.

**Table 1: Results of Phytochemicals of *Solanum melongena* cultivate under different treatments.**

| Test for Bringal | | | |
|---|---|---|---|
| **Phytochemical Test** | **T1** | **T2** | **T3** |
| **Carbohydrates** | + | + | + |
| **Phenols=Lead** | + | + | + |
| **Ferric** | _ | + | _ |
| **Saphonins** | _ | + | _ |
| **Gums** | _ | _ | _ |
| **Flavenoids** | - | _ | + |
| **Alkaloids** | - | + | _ |
| **Amino acids** | _ | + | + |
| **Reducing sugar** | + | + | + |
| **Fixed oil** | _ | - | - |

**+ = Present; - = Absent**

The result of comparative effects of organic and chemical fertilizer on total phenol of *Solanum melongena* was given in Figure 2. Effect of organic fertilizer in plant phenol was higher than that of chemical fertilizer. The values obtained for total phenol in organic treated leaf samples were 2.06±0.80 mg TA/g, respectively, as against values of 0.73±0.32 and 1.61±0.46mgTA/g for chemical fertilizer and control. Tannic acid was used as standard (Figure 1). Similar, Alphonse Ligoriya Mary and Nithiya, 2015 reported the effect of organic and inorganic fertilizer on growth, phenolic compounds and antioxidant activity of *Solanum nigrum* L and have showed that organic fertilizer produced higher effect on *Solanum nigrum* leaf when compared with inorganic fertilizer. Organically grown bitter gourd also produced higher amounts of antioxidants in the leaves compared with the chemically fertilized plants. The leaves of plants generally contained the highest total phenolics, total flavonoids and total tannins (Benitez et al., 2013).

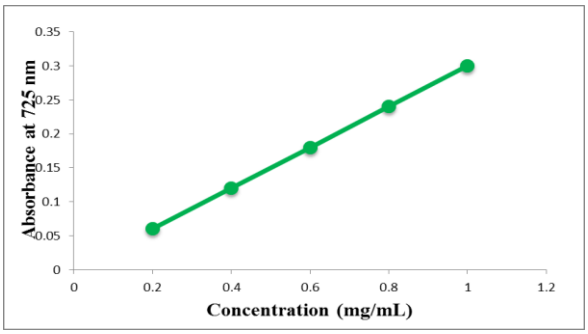


**Figure 1: Standard graph of tannic acid.**

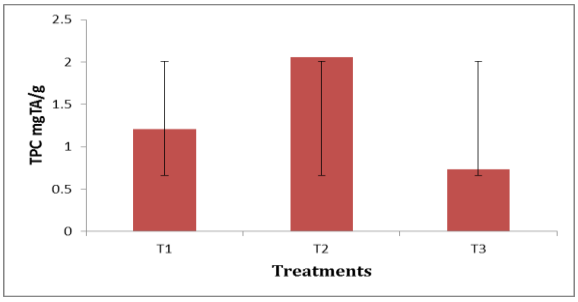


**Figure 2: Effect of organic and chemical fertilizer on total phenol content of Brinjal.**

Effect of organic and inorganic fertilizer on antioxidants compound flavonoid of *Solanum melongena* was shown in Figure 4. Results revealed a similar trend of higher mean values for organic fertilizer when compared with chemical fertilizer and control. Phenolic compounds occur as secondary metabolites in all plant species and they are generally characterized by a benzene ring and one hydroxyl group (Theunissen et al., 2010). In a similar study, it was concluded that organic fertilizer increased total flavonoid in bean compare to treatments receiving chemical fertilizers (Chavan et al., 2015).

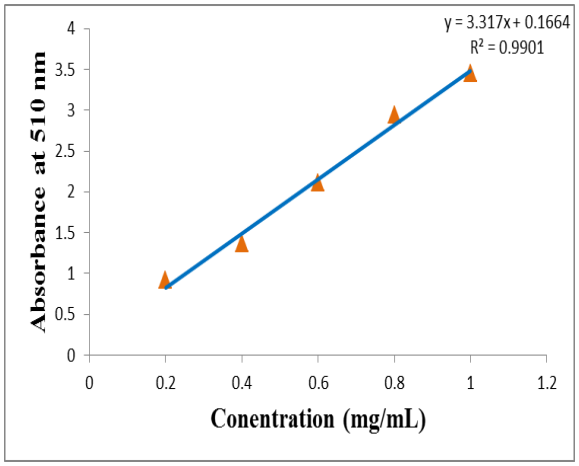


**Figure 3: Standard graph of quercetin for total flavonoid content.**

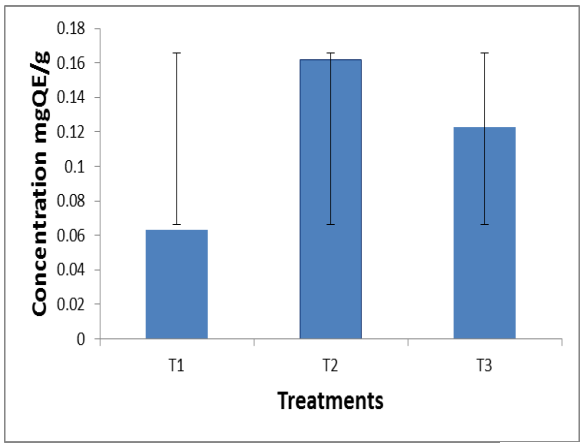


**Figure 4: Total flavonoid content in *Solanum melongena.***

## CONCLUSION

Organic vegetable production is controlled by essential macro and micronutrients and other growth promoting substances present in the growth media. Among all the fertilizer treatments for the growth, yield and chemical contents of brinjal (*Solanum melongena*) crop recorded significantly highest with the application of vermicompost as compared to remaining treatments and then followed by treatment with chemical fertilizer. The result indicates that application of vermicompost can enhance the growth parameter, nutritional content, phytochemicals and antioxidant activity of *Solanum melongena.* Therefore, it is concluded that vermicompost can be recommended for better growth and enhancement of phytochemicals in agricultural practices.

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