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Effect of Different soil Media on the Germination percentage and growth response of Tomato, Eggplant and Bell pepper

***Dr Tin Moe Phyu**

ABSTRACT

The experiment was carried out to study the effect of different soil media on growth response and percentage of germination of tomato, eggplant and bell pepper under field conditions. The production of good quality, healthy seedlings require the correct choice of both variety and seedling grower. Therefore, the experiment was conducted in the Department of Botany, Dagon University. Three species were selected for germination percentage and growth response on the different soil media in this experiment. Five treatments each with seven replicates were set up in completely randomized design (CRD). The result showed that the highest percentage of germination (50.0%) of tomato species and (76.79%) of egg plant species were observed from sand treatment .

Keywords: Tomato, eggplant , Bell pepper, soil media, germination percentage, growth response.

Introduction

Seedling production is an important step in the horticultural production system because it influences the final crop yield. Growing media is a major factor that influences seed germination, seedling emergence, seedling growth and quality of seedlings in a nursery. *(Corti et al*., 1998; Aklibasinda *et al*., 2011; Unal, 2013). Growing media is not only a place where seeds are sown and seedlings raised, but is also a source and reservoir of plant nutrients (Indriyani *et al*., 2011). Use of suitable growing media or substrate is essential for production of horticultural crops quality (Bhardwaj, 2014).

Tomato (*Solanumlycopersicum* L.) is a herbaceous plant that belongs to the Family solanaceae. The increase in area of production and value has increased the economic significance of the crop worldwide (Bodunde et al.,1993).

***Dr.Assistant lecturer, Department of Botany, Taunggoke degree**

Egg plant (*Solanum melongena* L.) is a popular vegetable crop growns in the subtropics and tropics. Eggplant is well regarded among the vegetables increasingly sought by consumers, whose demand for food with potential health promoting effects, such as disease prevention, is escalating (Cardoso et al., 2009). Bell pepper (*Capsicum annum* L.), which belongs to the Solanacea family, is one of the most popular vegetable crop and widely used foods in almost every part of the world (Abu-Zahra, 2012).

Germination of the seed is a critical stage, because the rest of the plant life is directly dependent upon the rate of its germination. Germination and seedling survival may differ between soil types, since moisture availability may be a function of soil type (Scheffer,1998). Therefore, the use of high-quality substrates is important, particularly in organic seedlings production because seedlings are very sensitive to factors of growing media during first stages of growth.

Vermicomposts (VC) are finely divided, peat-like materials with high porosity, aeration, drainage, water-holding capacity, and microbial activity. VC, are often used in sustainable farming systems to improve soil physical properties, provide plant nutrients, and recycle organic wastes. (Edwards 2004; Pandya et al. 2014). Effective Micro-organisms (EM), originates from Japan and is increasingly applied in organic and sustainable farming. The main micro-organisms in EM are lactic acid bacteria , yeasts , photosynthetic bacteria and fungi (Daly & Steward 1999; Higa, 2002). It is therefore the study was aimed to observe the effect of different soil types on germination of Tomato, Egg – plant, Bell pepper, To evaluate growth response on Tomato, Egg- plant, Bell pepper which are treated with different soil types . This study was also expected to know the growers with good nursery management techniques for raising healthy seedlings.

Materials and Methods

The experiment was conducted at a Department of Botany, Dagon University, Yangon Region during June 2017 to September 2017.

Experimental layout and treatments

The experiments were laid out in completely randomized design (CRD) consisting of five treatments, seven replicates and three species were used for this experiment. The treatments used for this experiment were based on different soil

media. Each treatment had 56 seeds and thus total of 280 seeds were sown in seed germination. The distance between plants (inside germination trays) and between row were 0.8cm each. The treatments of this experiment were as follows:

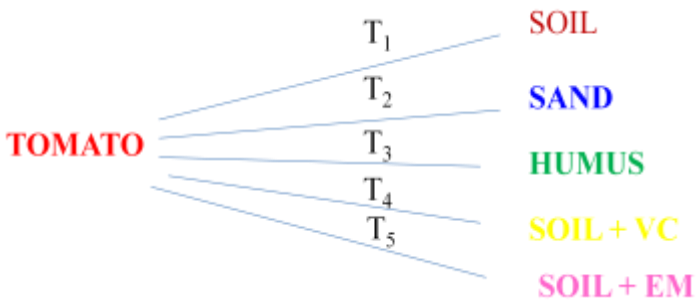
T_1= Soil

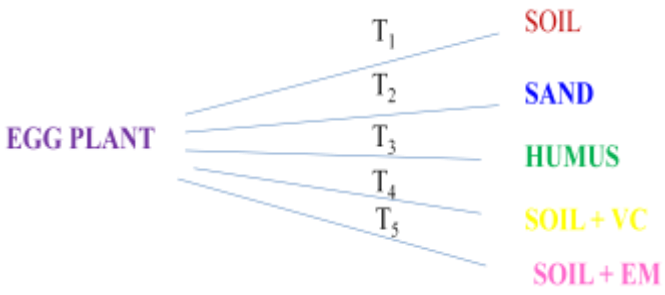
T_2= Sand

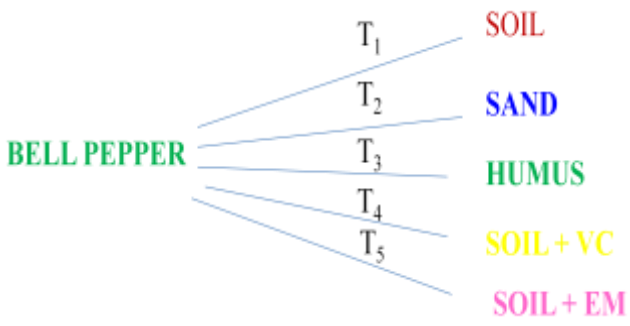
T_3= Humus

T_4= Soil + Vermicompost (VC)

T_5 = Soil + Effective Microorganisms (EM)







Cultural practices used for germination and growth response (The World Vegetable Center, 2015)

Obtaining seed: Choose locally appropriate tomato varieties and purchase healthy, recently produced seeds from a reliable source.

Seedling container or plug tray method

This method involves raising seedlings in separate pots/containers or plastic/Styrofoam plug trays to provide adequate nutrients and growing medium for healthy root development and seedling growth.

Growing medium: Fill the containers or plug trays with a medium that drains well, such as commercial potting soil, or a mixture of locally available materials such as soil, sand, well-decomposed compost and other good mixtures include vermicompost VC and effective microorganisms EM, to facilitate the emergence of seedlings.

Sowing: Prepare 0.5-1 cm deep furrows 6 cm apart, or 0.5-cm-deep holes 5 cm apart in seedling boxes or trays, and sow one seed per hole.

Watering: Use a fine sprinkler to water daily in the hot dry season or every two days in cooler weather. Avoid excessive watering.

Figur 1. Different soil media in trays

Data Collection

Day of germination was calculated from the time the seed was sown to the point of germination the number of seedlings germinated was also recorded and used to find percentage germination, the germination rate was calculated using the formula.

Germination percentage (%)= Germinated seeds X 100 (Soupe, 2009)

Total sown seeds

Results

Germination of three species

The seeds of tomato, egg plant, bell pepper sown on soil, sand, humus, soil + vermicompost and soil + effective microorganisms began to germinate five days after sowing (5 DAS) it was observed that out of seeds planted on each soil media.

The result of germination percentage showed that sand had the highest percentage (50.00 %and 76.79%) in tomato and egg plant species. The maximum percentage was found in humus of bellpepper (94.64%).

Table 1 .The germination percentage of treated different soil media of three species

Species	T1 (Soil)	T2 (Sand)	T3 (Humus)	T4(Soil+VC)	T5(Soil+EM)
Tomato	35.71	**50.00**	30.36	37.50	42.86
Egg – plant	19.64	**76.79**	30.36	10.71	8.93
Bell pepper	89.28	91.07	**94.64**	87.5	83.93

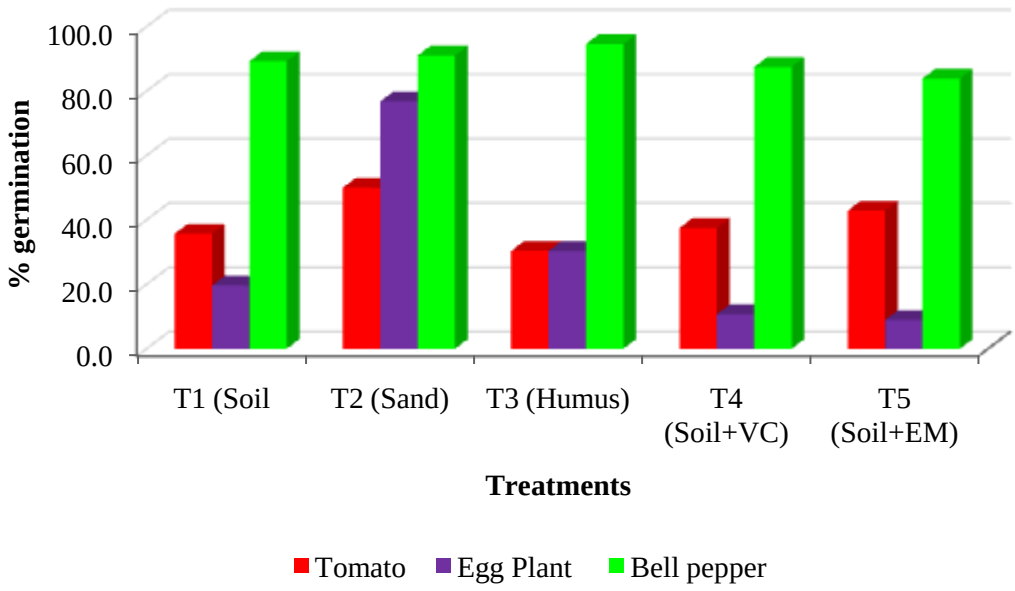


Figure 2. Germination effect on different soil media of three species

Growth response of three species

The evaluation on plant height revealed that soil + VC had the highest length (7.3 cm , 3.4 cm) in tomato and bell pepper species. The highest length had (3.1 cm) found in egg plant species.

Table 2. The growth response of treated different soil media of three species

Species	T1 (Soil)	T2 (Sand)	T3 (Humus)	T4(Soil+VC)	T5(Soil+EM)
Tomato	6.1	6.7	5.5	7.3	6.9
Egg – plant	0.6	3.1	2.3	1.2	1.4
Bell pepper	1.8	2.4	2.6	3.4	3.0

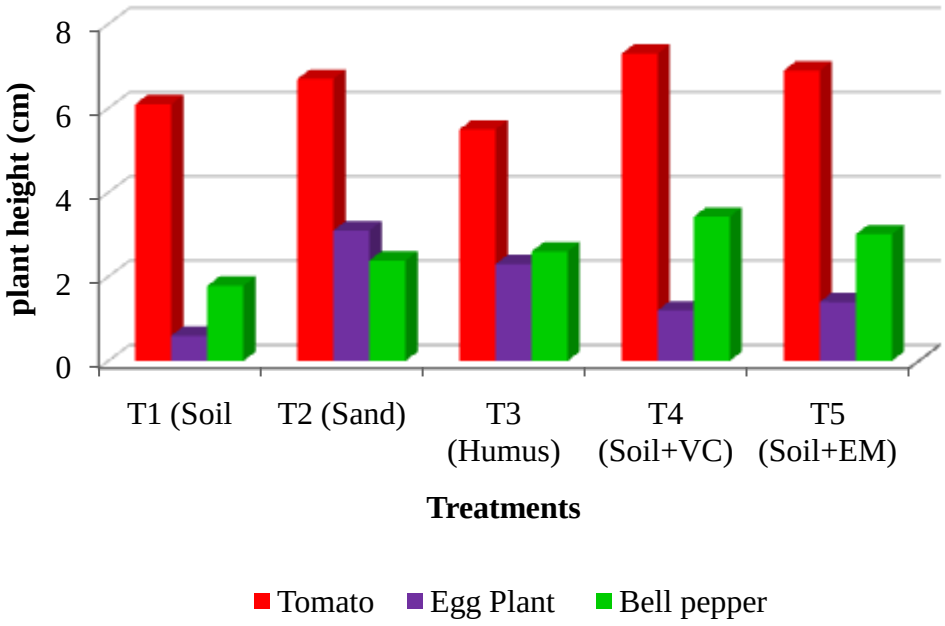


Figure 2. Plant height effect on different soil media of three species

Discussion and conclusion

In this experiment, the germination percentage and growth response on different soil media were carried out on the selected 3 species of Solanaceae family. The germination of seed were started after sowing four days and terminated after two weeks. Seedling germination rate was significantly different between treatments. The

result showed the highest percentage of germination (50.0%) was observed from sand treatment, while the lowest (30.36%) related to humus in tomato species. The treatment of sand produced the highest percentage of germination (76.79%) and the lowest percentage formed in the soil + EM (8.93%) in egg plant species. Sand provides for excellent seed germination and a high percentage of seedling survival.

The use of sand for the growing of seedlings, with the direct purpose of avoiding damping – off, has apparently been successfully accomplishes (Dunlap, 1936). The growth response of tomato and bell pepper seeds was observed the highest plant height in soil + vermicompost (7.3cm, 3.4cm respectively) (Figure.2). Vermicomposts plays a major role in improving growth and yield of different field crops, vegetables, flower and fruit crops (Patil & Sheelavantar 2000). Tahmineh Bahrampour (2013) determined the effect of vermicompost on growth, yield and fruit quality of tomato. The effects of earthworm-processed sheep manure (vermicompost) on growth, productivity, and characteristics of bell pepper fruits (Llaven, 2008). This result matches with many publication results before about effect of VC on seedling growth. Some studies reported that a wide range of vegetables germinated better in mixed substrates with VC than in commercial growth media (Atiyeh , 2001).

Under this experiment conditions, the maximum percentage of germination was observed in sand treatment . Soil + Vermicompost treatments increased plant height compared to other treatments . In conclusion, sand treated plants showed a good germination and VC treated plant influenced significantly to the seedling growth in three species. Improvement in germination and growth response when combine between sand and vermicompost was reflected in a better plant growth.

In this study, the most suitable treatment for germination is sand, whereas the best suitable treatment for growth response is vermicompost.

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Appendix

Figure 1. **Germinated on** soil

Figure 2. **Germinated on** sand

Figure 3. **Germinated on** Humus

Figure 4. **Germinated on** Soil + VC

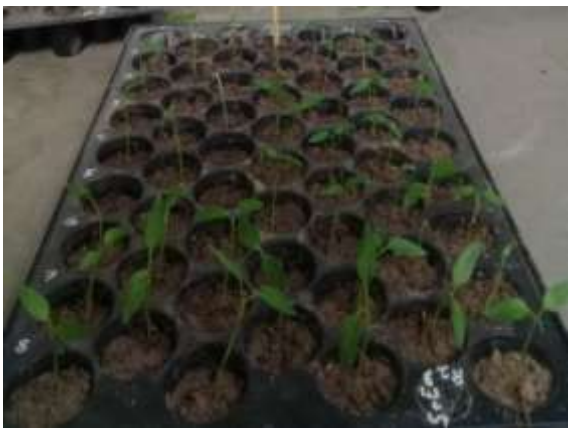

Figure5. **Germinated on** Soil + EM

Appendix Figure 1. Germinated plants of three species in different soil types