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The Effect of Different Types of Organic Fertilizer on Growth and Yield of *Solanum Lycopersicum L.* (Tomato)

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ABSTRACT

Purpose: Tomato (*Solanum lycopersicum L.*) is a kitchen table vegetable in Sri Lanka and it can be grown by using different types of organic fertilizers like compost, coco peat, cow manure, goat manure and poultry manure. This study aimed to evaluate the growth and yield of tomatoes grown under five different treatments to identify the most ideal organic fertilizer for better plant growth and yield of tomatoes.

Research Method: A black polybag experiment with five treatments and ten replicates for each treatment, in a Completely Randomized Design (CRD) was conducted in home gardening, Polgahawela, Sri Lanka. The treatments were cow manure (T1), poultry manure (T2), compost (T3) and coco peat (T4) along with control (T0). The data were collected on the growth and yield parameters including plant height (cm), number of branches on main stem per plant, diameter of main stem (cm), number of flowers per plant, number of fruits per plant and weight of fruits per plant (g). Obtained data have been analyzed using IBM SPSS Statistics version 29.

Findings: The highest significant differences in mean values of all parameters were given between control and compost. Next to the compost, poultry manure was depicted a significant difference between control. However, results were illustrated the positive effect of all organic fertilizers on growth and yield parameters of tomatoes than control treatment but coco peat treatment was not good as other fertilizer treatments. Therefore, efficiency of treatments according to decreasing order for both growth and yield parameters of tomatoes is as follows: compost > poultry manure > cow manure > coco peat > control.

Research Limitations: The research was limited to the integrated pattern of tomato, home gardening and tested organic fertilizers. Furthermore, complexity of interactions between organic fertilizers and soil microorganisms, caused to made it challenging to isolate the specific effects of the organic fertilizer alone.

Value: Considering study findings, compost could be recommended for the cultivation of tomatoes to improve both growth and yield and that is eco-friendly for promoting sustainable agriculture.

Keywords: *Coco peat, Compost, Cow manure, Organic fertilizers, Poultry manure, Tomato*

INTRODUCTION

In recent decades there has been impressive growth in food production, cause of food requirements of growing population day by day. The key areas under consideration in food production are food quality and safety. Many factors are influenced the crop quality in food production. Soil and plant factors, practice management and its factors, environmental and social factors, climatic conditions and also anti-nutrients and pollutants are some of them. Among them main factor is the fertilization system in practice management. Because significant challenge that restricts crop productivity is soil fertility (Kalbani et al., 2016). The type and quantity of fertilizers applied have a significant impact on the growth and production of crops (Chang et al., 2010). Therefore, farmers must regularly monitor the soil fertility conditions on their land plots to enhance agricultural production. To improve soil fertility and yield, inorganic or chemical fertilizers are frequently utilized. However, consumption of inorganic fertilizers has resulted in serious environmental issues including loss of biodiversity, soil, air and water pollution through nutrient leaching, deterioration of soil physical features and buildup of harmful compounds in water bodies (Agbede, 2010). Moreover, continued usage of synthetic fertilizer would negatively impact the nutritional value of crops (Shimbo et al., 2001) and also raise the cost of agricultural production. Nowadays, consumers all over the world perceive organic food as more nutritious, natural and environmentally friendly than non-organic or conventional foods. Therefore, most of families around the world are participating in organic home gardening practices. The majority of the population in Sri Lanka also switched to the concept of home gardening, which is done using organic fertilizers, due to the health concerns that arise from the utilization of chemical fertilizers. And also, current economic crisis in Sri Lanka further enhanced home gardening aspirations which are done by using organic fertilizers, especially among low-income marginalized communities in Sri Lanka.

Tomatoes (*Solanum lycopersicum L.*) are widely regarded as the most popular home garden crop and rank second in global consumption among vegetables, following only potatoes (*Solanum tuberosum L.*) (Laily et al., 2021). They are highly nutritious vegetables that are consumed worldwide in various forms, including fresh, canned and dried products. Tomatoes are rich in essential nutrients such as dietary fiber, sugar, essential amino acids, vitamin B and C, iron and phosphorus, as well as secondary metabolites like lycopene, quercetin, kaempferol, naringenin, caffeic acid, rutin, resveratrol, catechin and luteolin. Although a ripe tomato contains much as 93% to 94% water which contributes to the maintenance of good health and well-balanced diet (Navarro-González et al., 2011). Moreover, tomato is an important cash crop which has a short growing season and a high yield. Therefore, tomato is an economically appealing crop with high potential for export in worldwide. China is the world's top tomato producer, followed by the US and India. The European Union and Turkey are additional significant market participants for tomatoes. Around 70% of the world's tomato production is supplied by these top five producers combined (Guan et al., 2018). In Sri Lanka, it can be grown in almost all agro-climatic zones except up country wet zone. Tomato plants thrive in soils that drain well and get full sun for the majority of the day. The pH of the soil should be between 5.5-7.5 (Department of Agriculture Sri Lanka, 2015). And also, better soil fertilizing is beneficial for improved growth and yield of tomatoes. Widely recognized is the fact that organic fertilizers are more effective in enhancing soil fertility and quality when compared to chemical fertilizers (Hasnain et al., 2020). Organic fertilizers are typically derived from plant or animal residues that have been decomposed or are in the process of decomposing. Organic mulches such as legume, hay or leaves, green manure, compost without artificial additives and raw or composted animal manures are a few examples of common organic fertilizers (Moneruzzaman Khandaker et al., 2017). In this study, we were tried to evaluate effect of organic fertilizers on growth and yield of tomato based on cow manure (T1), poultry manure (T2), compost (T3) and coco peat (T4) to identify the best one among them which enhances both growth and yield of tomato.

The use of cow dung, also known as cattle manure in the garden is a common practice in many rural areas due to its higher content of nutrients. Cow manure primarily comprises grass and grain that have undergone digestion. About 3% nitrogen, 2% phosphorous and 1% potassium make up the majority of its composition. Furthermore, cow manure has a significant concentration of ammonia. However, this sort of manure does not contain as much nitrogen as many other types (Nikki tilley, 2021).

Poultry manure contains all thirteen kinds of vital nutrients that are required by plants for their proper growth. They are nitrogen (N), phosphorous (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), manganese (Mn), copper (Cu), zinc (Zn), chlorine (Cl), boron (B), iron (Fe) and molybdenum (Mo). Mostly, plant nutrients are gained from the food, supplements, medications and water that are ingested by animals. Therefore, the consumption of poultry manure which provides a portion or all of the plant growth and yield requirements for crops or trees is one of the most popular usages among most farmers throughout the world (Chastain et al., 2014).

Compost is an organic fertilizer produced from weed, plant residues, kitchen waste, leftover food, recycling papers and different types of manures commonly in as little as 14 days by carefully manipulating both the chemical composition like C:N ratio as well as the physical processes of aeration, moisture and temperature management (Consarc (Pvt) Ltd, 2017). Its primary purposes include providing organic matters to the soil, enhancing soil structure and supplying essential nutrients to plants to increase crop yield and nutritional quality of the crops. Compost can be used to improve soils in gardens, lawns, landscaping, horticulture, urban agriculture and also organic farming as an alternative solution for commercial chemical fertilizers. Not only that, compost acts as a soil conditioner to increase the humus or humic acid contents, soil moisture content and cation exchange capacity. Furthermore, this is essential to introduce beneficial microbes into the soil. They allow nutrients to pass from the soil into plant roots and to suppress pathogens in the soil and reduce the soil-borne diseases. Not only that, compost can balance soil pH levels. Therefore, it acts as a buffer, neutralizing overly acidic or alkaline soils and creating an optimal pH range for plant growth (Spurt industries, 2019).

The residue, produced when coir fiber is extracted from coconut husk is known as cocopeat, also known as coir pith, coir fiber pith, coir dust or simply coir. Composted or old mulched coir dust is collected and then screened and dried before being made into small blocks or bales with different granularities and densities, which are subsequently utilized for horticultural, agricultural and industrial absorbent purposes. Cocopeat typically has a strong capacity to retain water for plant growth. When water is added, this substance becomes eight times heavier. Additionally, the natural rooting hormones and anti-fungal qualities of this clean coir can help plants grow more effectively. As a result, cocopeat works well as a growing medium for both container plants and hydroponics plants (Consarc (Pvt) Ltd, 2017).

MATERIALS AND METHOD

Experimental Site & Duration

The experiment was carried out in a fully open area in a home garden at No 117/1, Gorokgahapoththa, Polgahawela, Kurunagala in North western province. It is located at an elevation of 82.00 m above sea level in the latitude of 7 ^{0}33’ North and the longitude of 80 ^{0}29’ East. Therefore, this area is categorized as low country intermediate zone (IL1a) under the Agro-Ecological Regions of Sri Lanka. The annual mean temperature ranges from 32.11^{0}C to 27.09°C, and the mean annual rainfall is 1400 mm. This black polybag experiment was conducted from 06th of December in 2022 to 1st of April in 2023.

Media Preparation

Five types of media were used with five different types of treatments in preparing the black poly bags. The treatments were cow manure (T1), poultry manure (T2), compost (T3), coco peat (T4) and no fertilizer as a control (T0). Compost and coco peat were purchased from the local market. Poultry manure and cow manure were collected from local farmer in gorokgahapoththa and had been well-decomposed and were ready for application. Loamy soil was obtained from the home garden at a depth between 0-15 cm. Available N, P, K content, moisture content and pH value of loamy soil, cow manure (T1), poultry manure (T2), compost (T3) and coco peat (T4) were measured as their chemical properties. N, P, K content of loamy soil was measured by using NPK soil sensor. Available N, P and K content of fertilizers was measured by using Titration method, Olsen method and Flame photometry method respectively. Moisture content of all samples was measured by using oven dry method. (100^0C, 24hr.) pH was measured by using pH meter at 25^0C. Two days before transplanting, each polybag was filled with a mixture of loamy soil and treatment in 1:1 ratio (4L:4L) as shown in Table 01.

Table 01: Media used in experiment.

Treatments	Media composition for each polybag
T0	loamy Soil : loamy Soil – 1:1 - (4L: 4L)
T1	loamy Soil : Cow manure – 1:1 - (4L: 4L)
T2	loamy Soil : Poultry manure – 1:1 - (4L: 4L)
T3	loamy Soil : Compost – 1:1 - (4L: 4L)
T4	loamy Soil : Coco peat – 1:1 - (4L: 4L)

Experimental Design

An experiment with five treatments and ten replicates for each treatment (a total of 50 tomato plant polybags) was arranged in a Completely Randomized Design (CRD) (Table 02) with maintaining a spacing of 30 cm between rows, and 20 cm between polybags within rows.

Table 02: Layout of treatments arrangement.

1T1	6T4	8T2	7T3	1T0	2T1	3T2	1T3	2T4	10T0
3T0	9T3	8T1	1T4	4T2	6T0	6T3	10T2	8T0	9T2
4T3	7T2	8T4	10T1	7T4	10T3	2T0	7T1	2T2	3T4
5T2	4T1	5T0	9T0	8T3	6T2	4T4	7T0	5T3	5T1
5T4	4T0	3T3	1T2	6T1	10T4	9T1	9T4	3T1	2T3

Crop Establishment & Maintenance

Tomato seeds marketed by local seed seller had sown in a basin that was contained loamy soil in a small shade net. Seeds were covered with loamy soil to avoid floating of seeds during watering and were instantly irrigated with 500 mL of tap water. Watering was done with 500 mL per plant regularly throughout this nursery stage until getting three weeks age. After three weeks at the nursery, well-grown, vigorous, healthy and uniform seedlings were transplanted in black poly bags at the rate of one plant per bag. There were four holes at the bottom of each polybag to facilitate excess water drainage. After transplanting, all plants were immediately irrigated with 500 mL of water per plant. Throughout the first four weeks after transplanting, was added 500 mL of water per plant. Next second four weeks, was added 1000 mL of water per plant. Throughout the resting growing period, until picking tomato fruits, was added 2000 mL of water per plant. Relevant fertilizer treatments were added twice during the growing season after planting seedlings at a rate of 4L per experimental unit as a top dressing. Backing was done to support plant growth after five weeks of transplanting. All the cultural practices were similar for each treatment including weeding and watering regularly throughout the growing period. The polybags were kept free of weeds until the final harvest. To control pests and diseases, 2% aqueous neem leaf extract was sprayed once every two weeks.

Data Recording

Data were collected separately from all plants of each treatment by considering both growth and yield parameters. Plant height, number of branches on main stem and diameter of main stem were considered as growth parameters while number of flowers per plant, number of fruits per plant and weight of fruits per plant were yield parameters. After 54 days of transplanting, plant height in centimeters was recorded from the soil level to the plant tip by using a meter tape. Number of branches on the main stem was counted. And also, diameter of the main stem was measured in centimeters by using a vernier caliper from 2.5 cm above the ground level. As yield parameters, number of flowers per plant was counted 60 days after transplanting. Finally, the number of fruits per plant (well-grown fruits with green yellow color) were handpicked and counted. The total weight of fruits per plant was recorded at maturity.

Statistical Analysis

The statistical software IBM SPSS (version 29) was employed to analyze all of the data. The data was presented as the mean values with standard error for all parameters of all treatments. To provide the comparison of significant differences in the means of each parameter among the treatments, one-way ANOVAs were used. Afterwards, post hoc tests were utilized for multiple comparisons between all treatments for those parameters that showed a significant difference, using the least significance difference (LSD) test at the 0.05 probability level ($P < 0.05$).

RESULTS & DISCUSSION

Table 03: Some chemical properties of the used soil (0-15 cm depth).

Soil Texture	pH	Moisture content	Available N content (mg/kg)	Available P content (mg/kg)	Available K content (mg/kg)
Loamy Soil	7.2	24%	56	19	151

The results of the chemical analysis of the loamy soil that was utilized prior to the experiment's commencement are presented in Table 03. The results showed that loamy soil was naturally slightly basic with pH 7.2. Available N, P, and K contents are 56, 19, 151 mg/kg respectively. The confirmed soil moisture content was 24%. These results confirmed that the soil selected for the test was not very suitable for successful tomato cultivation without the use of fertilizers. Therefore, it was helped to obtain sufficient evidence about the effect of organic fertilizers to be studied on growth and yield of tomatoes.

Because, the amount of nutrients present in the soil has an impact on how the crop responds to fertilizer application. Compared to soils with a high nutrient reserve, crops with extremely low nutrient content soils respond more strongly to fertilizer treatment (Makinde et al., 2007; Uko et al., 2009). Tomato yield, nutrient content, taste and quality of post-harvest storage can all be retained on the quantity and type of nutrients given to the plant. Tomatoes require nutrients such as N, P, K, Mg, Ca and S in large amounts. In trace levels, other elements like Fe, Cu, Zn, Mn, B, Mo, and Cl are required. Tomatoes are so frequently fertilized with N, P and K and infrequently with Ca and Mg. Desirable levels of N, P, K in soil for proper growth of tomatoes are 50-100, 60-70, 600-700 mg/kg respectively. Therefore, if these nutrients are not present in the soil in proper amounts, they must be given to the plant in appropriate amounts through fertilizers at appropriate times. Because tomato plants cannot grow properly or bear fruits, without these nutrients (Sainju et al., 2003).

For example, nitrogen (N) plays a crucial role in plant growth and yield including synthesis of chlorophyll, nucleic acids, amino acids and proteins. And also, nitrogen is takes part in number of plant growth and developmental processes, such as cell elongation and division. It stimulates root development, stem growth and leaf expansion, leading to increased biomass accumulation and plant size. In addition to that nitrogen influences the reproductive capacity of plants by promoting flower and seed formation. It affects the number, size and quality of fruits and seeds. It means sufficient nitrogen availability in growth medium during critical growth stages enhances growth and yield potential of tomatoes more and more. Nitrogen is available to plants as nitrate and ammonium ions (Leghari et al., 2016).

After nitrogen, phosphorous is a very important nutrient for better plant growth. Phosphorus (P) also helps to initiate and vigorous root growth that can help in better absorbance of water and other nutrients in the soil. Not only that, promotes sturdy growth of stem and healthy foliage as well. As a component of nucleic acid, P helps promote the formation of lots of blossoms. Finally, it causes to increase the frequency of tomato fruit production and the number of fruits produced at a time. Not only quantity, it also improves the quality of tomato fruit by raising taste, vitamin C content, hardiness and color of skin and pulp. Phosphorus fertilizers, such as nitro phosphate or triple superphosphate, are desirable for the growth and yield of tomatoes due to their rapid availability (Sainju et al., 2003).

In addition to N and P, for better plant growth of tomatoes, potassium (K) is also very important. It can maintain the water status and ionic balance within the plant. And it is also, involved in the stomata control, enzyme activation, protein synthesis and production and transport of sugars in the plants. The synthesis of pigments in tomatoes, notably lycopene, which has the potential to prevent prostate cancer in humans, also depends on potassium. And also, K have the ability to reduce susceptibility to plant diseases. K is available to plants as the ion K^+ (Uchida R., 2000; Sainju et al., 2003).

Not only nutrients, but also soil water availability is directly related to the optimum growth and yield of tomato plants. Therefore, Imana & Opiyo (2010) recommended keeping soil water levels between 80% and 100% of field capacity as the best way to promote the optimum growth for tomato plants. Otherwise, the plant undergoes water stress, which lowers the water pressure inside the leaves and causes the plant to wilt. It may be responsible for slow plant growth by reduction of photosynthesis, more susceptible to disease and being less tolerant of insect feeding.

Unsuitable soil pH may be another obstacle factor in agricultural practices. Soils with a pH of too less than 7 (acidic) and higher than 7 (alkaline) inhibited plant growth and crop production due to suppressing nutrient and water uptake. Because the soil pH can affect the availability of nutrients, absorbance of both nutrients and water directly. When the pH of the soil is either too high or too low, certain nutrients become insoluble, thereby reducing their accessibility to the plant system (Keri Jones, 2020). According to Astija's research conducted in 2020, the pH level of the soil can have a significant impact on the formation and growth of the root organ system of tomato plants. They mentioned that pH 7 is the appropriate pH level for enlarging the tomato plant root size and the too acidity or more alkalinity nature of the soil can have a detrimental effect on the physical structure of the root system. So, it may inhibit the nutrient and water uptake to the plant and transportation of them to the upwards of the plants. Because larger root sizes are necessary for plants to absorb and transport different kinds of nutrients and water to their stems, leaves and other plant parts. However, water and fertilizer typically alter the soil pH more rapidly (Keri Jones, 2020). Therefore, it is advisable to pay more attention to the types of fertilizers and their pH values that are used in tomato cultivation.

The chemical analysis of the organic fertilizers employed (Table 04) indicates that compost contains notably elevated levels of N, P and K compared to other fertilizer sources. Therefore, compost may have led to the enhancement in the nutrient availability in that soil greatly.

Table 04: Some chemical properties of different organic fertilizers used in experiment.

Organic fertilizer	pH	Moisture content	Available N content (%)	Available P content (%)	Available K content (%)
Cow manure	6.5	16%	1.1	0.9	0.5
Poultry manure	6.5	14%	2.2	1.1	1.8
Compost	6.9	55%	3.1	1.6	2.5
Coco peat	5.6	38%	0.5	0.03	0.25

Results in Tables 05,06,07 and Fig. 1,2,3,4,5 and 6 showed that tomato yield and growth parameters were significantly influenced by different organic fertilizers.

Table 05: Effect of five different treatments on growth parameters of tomato.

Treatments	Height of plant after 54 days of transplanting (cm)	Diameter of the main stem after 54 days of transplanting (cm)	Number of branches on main stem per plant after 54 days of transplanting
T0 - Control	38.50 ± 9.01	0.4900 ± 0.0936	2.300 ± 0.597
T1 - Cow manure	59.40 ± 9.60	0.6800 ± 0.0998	4.300 ± 0.978
T2 - Poultry manure	68.10 ± 11.0	0.6900 ± 0.1020	4.800 ± 0.940
T3 - Compost	79.50 ± 9.77	0.7700 ± 0.0844	5.100 ± 0.823
T4 - Coco peat	41.20 ± 7.71	0.5000 ± 0.0730	2.500 ± 0.703
P - Value	0.016	0.132	0.052

Values are mean ± SE (n=10)

Table 06: Effect of five different treatments on yield parameters of tomato.

Treatments	Number of Flowers per plant after 60 days of transplanting	Number of Fruits per plant	Total weight of Fruits per plant (g)
T0 - Control	3.50 ± 1.57	1.30 ± 0.616	80.3 ± 46.8
T1 - Cow manure	6.50 ± 1.70	4.00 ± 1.41	220.2 ± 79.2
T2 - Poultry manure	10.90 ± 2.71	8.40 ± 2.32	455 ± 127
T3 - Compost	12.20 ± 3.04	8.40 ± 2.37	461 ± 128
T4 - Coco peat	5.00 ± 1.61	2.00 ± 0.775	95.7 ± 38.3
P - Value	0.032	0.006	0.006

Values are mean ± SE (n=10)

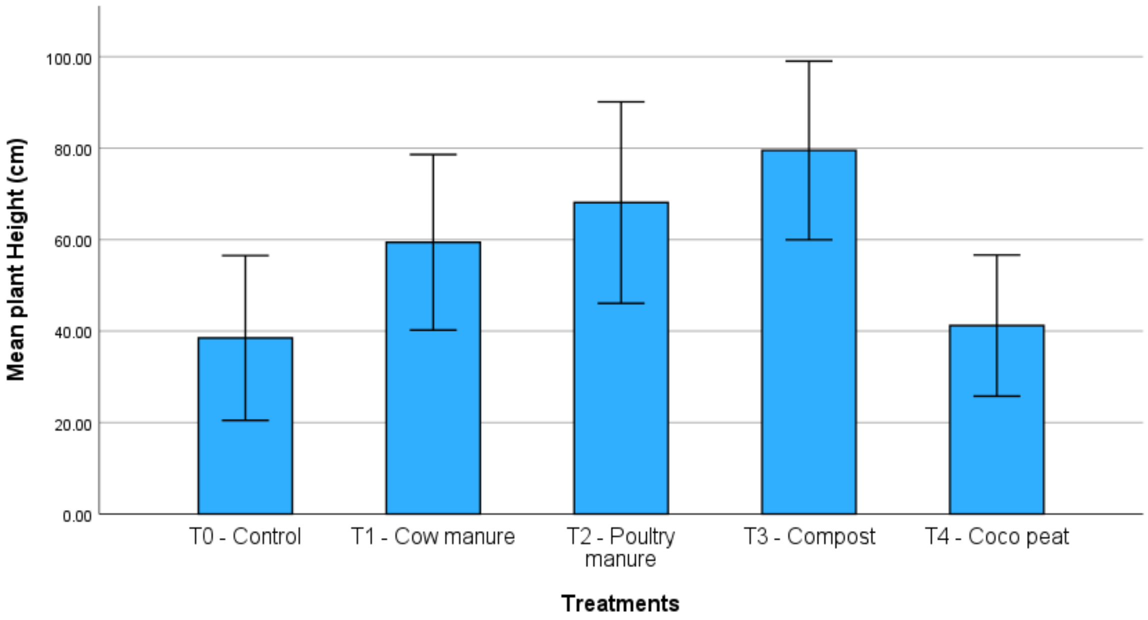

Figure 01: Effect of five different treatments on plant height (cm) of tomato after 54 days of transplanting.

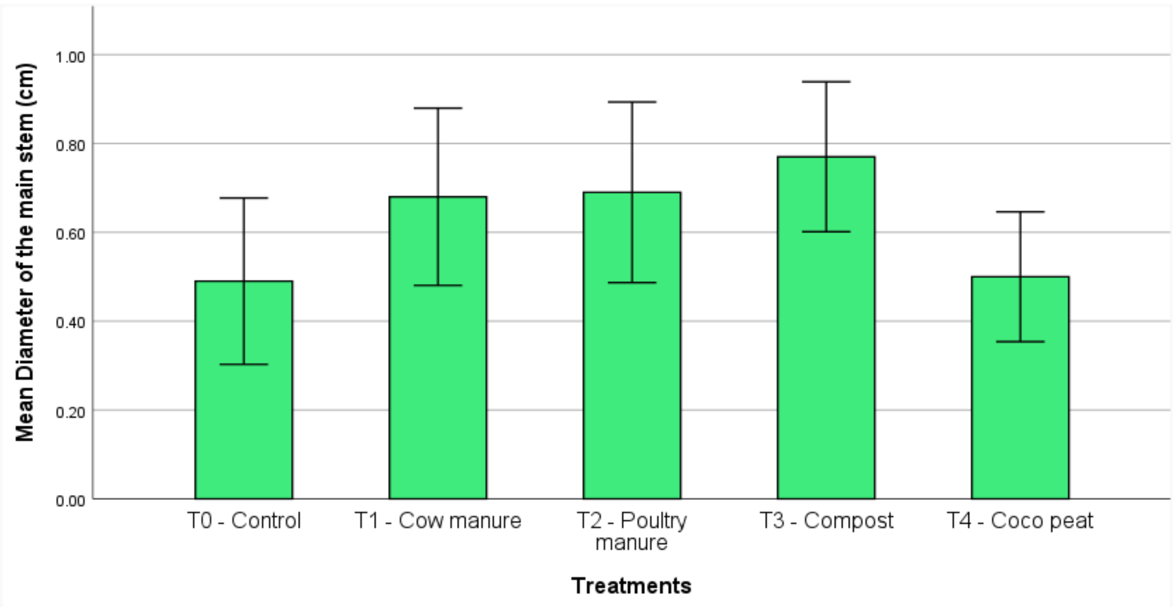

Figure 02: Effect of five different treatments on diameter of the main stem (cm) after 54 days of transplanting.

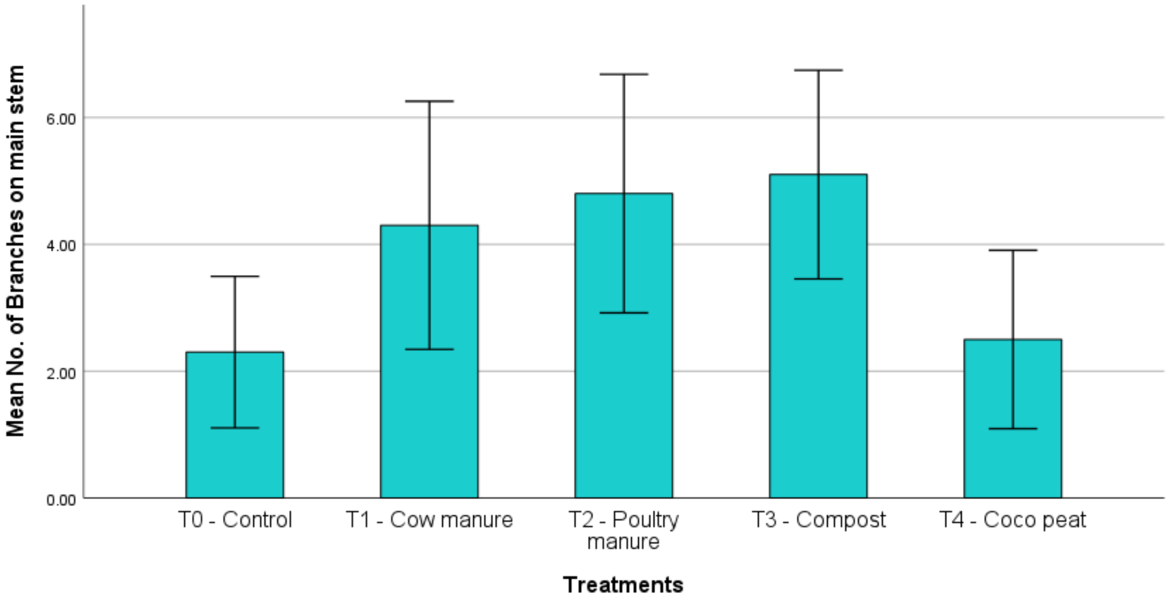

Figure 03: Effect of five different treatments on number of branches on main stem per plant after 54 days of transplanting.

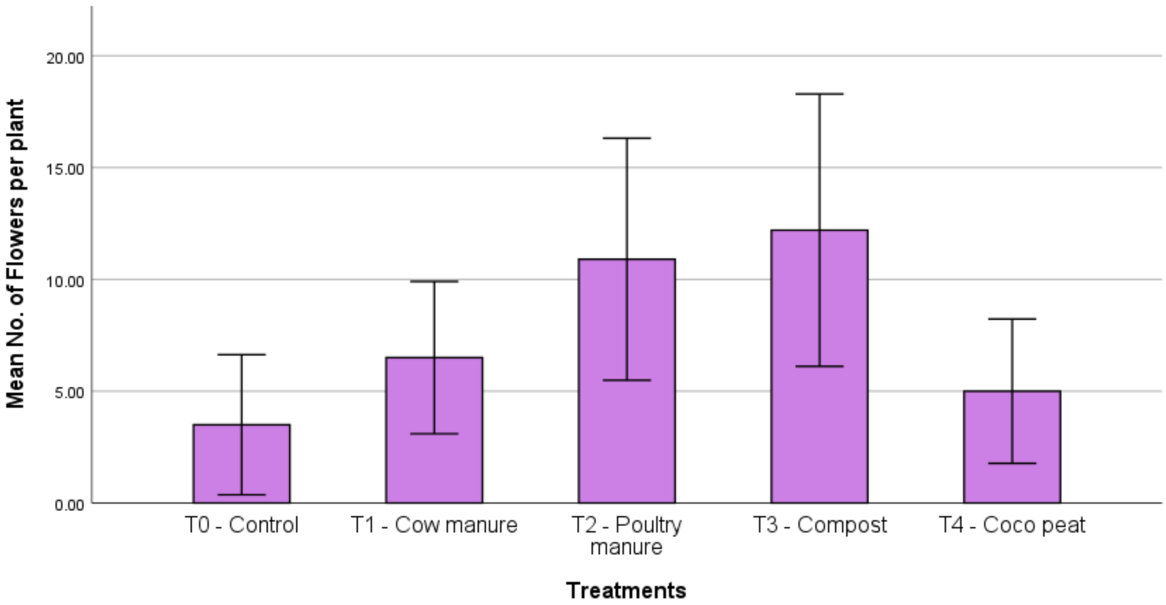

Figure 04: Effect of five different treatments on number of flowers per plant after 60 days of transplanting.

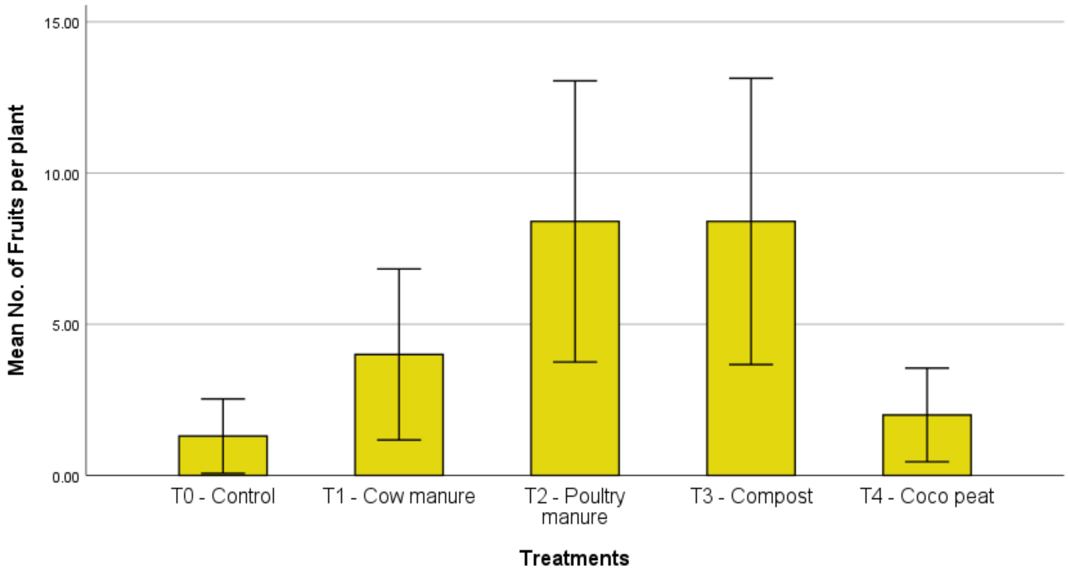

Figure 05: Effect of five different treatments on number of fruits per plant of tomato.

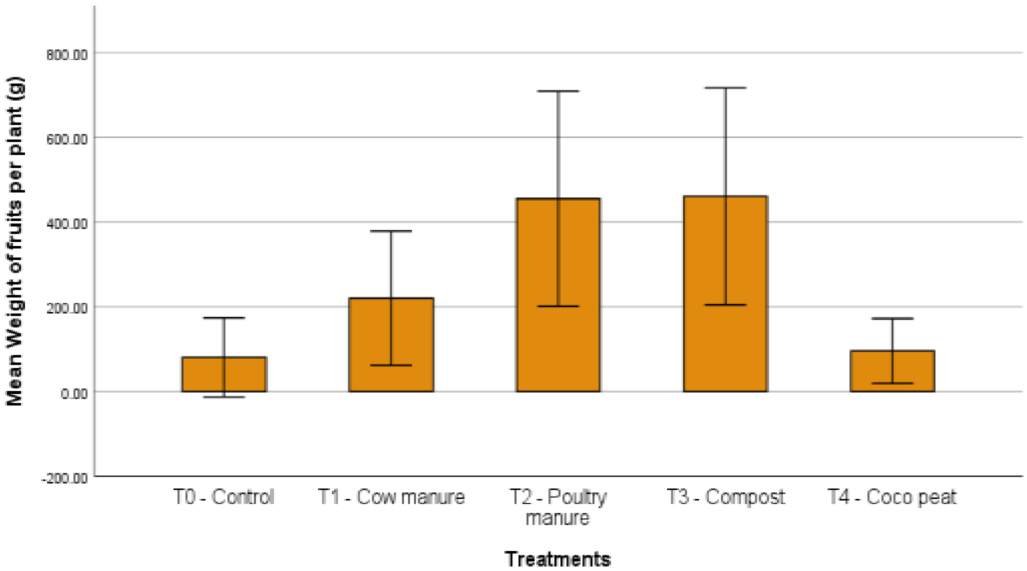

Figure 06: Effect of five different treatments on total weight of fruits per plant (g).

Table 07: Multiple Comparisons between all treatments (LSD Test).

		Plant height	Main stem diameter	No. of Branch-es on main stem	No. of Flowers per plant	No. of Fruits per plant	Weight of fruits per plant
Treatments		P. Value					
	T1 - Cow manure	0.126	0.147	0.092	0.343	0.260	0.289
T0 -Control	T2 - Poultry manure	0.032*	0.128	0.037*	0.023*	0.004*	0.006*
	T3 - Compost	0.004*	0.036*	0.020*	0.008*	0.004*	0.005*

	T4 - Coco peat	0.841	0.938	0.864	0.634	0.769	0.906
T1 - Cow manure	T0 - Control	0.126	0.147	0.092	0.343	0.260	0.289
	T2 - Poultry manure	0.520	0.938	0.669	0.167	0.069	0.078
	T3 - Compost	0.141	0.488	0.494	0.075	0.069	0.072
	T4 - Coco peat	0.181	0.169	0.128	0.634	0.402	0.344
T2 - Poultry manure	T0 - Control	0.032*	0.128	0.037*	0.023*	0.004*	0.006*
	T1 - Cow manure	0.520	0.938	0.669	0.167	0.069	0.078
	T3 - Compost	0.400	0.538	0.797	0.680	1.000	0.967
	T4 - Coco peat	0.051	0.147	0.054	0.066	0.010*	0.008*
T3 - Compost	T0 - Control	0.004*	0.035*	0.020*	0.008*	0.004*	0.005*
	T1 - Cow manure	0.141	0.488	0.494	0.075	0.069	0.072
	T2 - Poultry manure	0.400	0.538	0.797	0.680	1.000	0.967
	T4 - Coco peat	0.006*	0.042*	0.030*	0.026*	0.010*	0.008*
T4 - Coco peat	T0 - Control	0.841	0.938	0.864	0.634	0.769	0.906
	T1 - Cow manure	0.181	0.169	0.128	0.634	0.402	0.344
	T2 - Poultry manure	0.051	0.147	0.054	0.066	0.010*	0.008*
	T3 - Compost	0.006*	0.042*	0.030*	0.026*	0.010*	0.008*

* The mean difference is significant at the 0.05 level.

Table 05 and Fig. 01 depict that mean values of plant height differed significantly (P = 0.016) after 54 days of transplanting in different treatments and it was maximum average (79.5 cm) in compost treated pots followed by 68.1 and 59.4 cm in poultry & cow manure respectively whereas 41.2 and 38.5 cm in coco peat and control respectively. On further in-depth investigation, Table 07 mentions about statistically highest significant difference in mean values of plant height between control and compost treatments (P = 0.004). Not only that there was a significant difference in mean values of plant height between coco peat and compost (P = 0.006), poultry manure and control (P = 0.032) as well.

According to Fig. 02, main stem diameter was also maximum average (0.77 cm) in compost treated pots followed by 0.69, 0.68, 0.5 and 0.49 cm in poultry manure, cow manure, coco peat and control respectively. Fig. 03 is evident that highest average number of branches was given from compost treatment as 5.1, when control gives lowest average number of branches as 2.3. However, poultry manure, cow manure and coco peat had been given it as 4.8 and 4.3, 2.5 respectively. Test results of One-way ANOVAs given P – values for diameter of main stem and number of branches on main stem, as 0.132 and 0.052 respectively (Table 05). It indicates there was no significant difference in mean values between any two different treatments for both of these parameters. However, according to LSD test results, Table 07 shows there were significant differences in mean values of main stem diameter between control and compost (P = 0.035) as well as compost and coco peat (P = 0.042). Not only that, number of branches on main stem also shows statistically significant differences in mean values between control and compost, control and poultry manure as well as coco peat and compost. Because their P – values are 0.02, 0.037 and 0.03 respectively.

The maximum average number of flowers per plant after 60 days of transplanting was mentioned as 12.2 in compost treated pots followed by 10.9, 6.5, 5 and 3.5 in poultry manure, cow manure, coco peat and control respectively by Fig. 04 and Table 06. There were significant differences in mean values of number of flowers per plant between control and compost (P = 0.008), control and poultry manure (P = 0.023) and coco peat and compost (P = 0.026).

Fig. 05 depicts the number of fruits per plant which is one of the yield parameters. There was maximum average number (8.4) in both compost and poultry manure treated pots whereas 4, 2 and 1.3 in cow manure, coco peat and control respectively. P – value of 0.006 which was less than 0.05 level, mentioned in Table 06 according to this parameter is given a hint about a remarkable statistically significant difference in means at least between two different treatments. Then Table 07 is provided evidence about there were significant differences in mean values between control and compost as well as control and poultry manure. Because the P – value for both comparisons is 0.004. Not only that, coco peat and compost, coco peat and poultry manure comparisons are also included in it. Because P - values of both of them were 0.01 which was less than 0.05.

The maximum and minimum average weight of fruits per plant, was given by compost and control treated pots as 460.5g and 80.3g respectively. And it was followed by 455.1g in poultry manure, 220.2g in cow manure and 95.7g in coco peat (Fig. 06). Multiple comparisons between all treatments, provided evidence (P < 0.05) that there were significant differences in mean values of weight of fruits per plant between control and compost, control and poultry manure, coco peat and compost as well as coco peat and poultry manure (Table 07).

According to descriptive analysis, the best growth and yield parameters of the tomato were recorded by plants supplied with compost. The lowest values of tomato growth and yield parameters were obtained by control treatment. Inferential statistically it was proven again with the highest significant differences in mean values of all parameters between control and compost by lowest P values. Results were illustrated the positive effect of all organic fertilizers on growth and yield parameters of tomatoes than control treatment but coco peat treatment was not as good other fertilizer treatments. It was obvious that compost and animal manures had a synergistic effect on both growth and yield parameters of tomatoes than coco peat furthermore. Therefore, the efficiency of treatments can be arranged in decreasing order as follows: compost > poultry manure > cow manure > coco peat > control.

According to the experimental findings of the current study, compost was the organic fertilizer that had the greatest influence on the tomato plant's growth and yield parameters. But most of the farmers in Sri Lanka think of poultry manure, cow manure and goat manure when organic fertilizers are mentioned. And they use the same farm manure the most. It is also affected by its availability. Being able to apply it easily without processing is another reason for its widespread use. But a more advanced and successful agricultural method is applying compost as we mentioned in our study also, which involves the digestion of a wide range of organic materials, including farmyard manure, dry and raw crop residues by partially aerobic microorganism digestion. The final product of composting is a humus-type material that can be easily absorbed by crops. One of the main differences between compost and other organic fertilizers is their functionality and their effect on soil health. While other organic fertilizers primarily provide specific nutrients to plants, compost has a broader, systemic effect on both plants and soil. Because of its different types of organic matter content, compost improves soil structure, improves moisture retention, and supports the proliferation of beneficial microorganisms. Compost acts as a slow nutrient release fertilizer. Therefore, it can release nutrients gradually over time as it continuously breaks down in the soil. Additionally, compost has been shown to suppress certain plant diseases, reduce soil erosion, and promote healthy plant root growth. And also, its ability to improve soil structure and water retention makes it valuable for especially in sandy and clay soils. Furthermore, composting also provides environmental benefits by keeping organic waste out of landfills and also reducing the need for chemical fertilizers (Diacono & Montemurro, 2010; Martínez-Blanco et al., 2013).

CONCLUSION

The present investigation which was done by us shows that it would be possible to increase tomato production in Sri Lanka by improving the soil fertility of natural soil by using different types of organic fertilizers. In particular, the use of animal manures appears to be much more satisfactory than fertilizers which are made exclusively from plant materials, such as coco peat. Therefore, to improve the growth and yield of tomatoes and soil fertility, it is more appropriate to use plant based organic fertilizers and animal manure together in the form of compost rather than using them separately.

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