The efficacy of sugar cane compost and cow dung manure on the growth of tomato in tropical rain forest of Liberia

Abstracts

A study was conducted at the Agriculture Department, CEPRES International University, Gbarnga City, Bong County, Liberia. The objective of this study was to assess the effect of organic fertilizers on the growth of Tomato. The research design adopted was Randomized Complete Block Design (RCBD), three replications of treatments. A plot measured 1.5 m x 1.5 m with a walk-way of 0.5 m. There were Three blocks consisting of three plots in each block. A total of 9 plots were used. The spacing was 50 cm x 50 cm. The four treatment levels were: T1 = 4,000 kg/ha (Cow Dung), T2 = 4,000 kg/ha (Cover-crop Compost) and T3 = 0 kg/ha (Control). The data were collected in a 30 days interval from the date of sowing using micrometer and measuring tape rule. The results revealed that the highest plant height mean was recorded for the compost treated plots as 73.61 cm. The results for leaf length showed that the longest leaf mean was calculated for the compost treated plots as 36.24. The leaf width analysis depicts that the widest leaf mean was computed for the cow dung treated plots as 46.91 cm. The number of leaf analysis indicated that the most plenty leaf mean was analyzed for the compost treated plots as 34.33 while the least number of leaf mean was analyzed for the control plots as 21.33. Another analysis conducted on the stem diameter showed that the biggest stem diameter mean was analyzed for the compost treated plots as 1.28 cm while the smallest stem diameter mean was analyzed for the control plots as 0.92 cm. The recommendations reached are cover compost be used for tomato production and similar study be conducted on different crops.

Keywords: *sugarcane, cow dung, growth and tomato*

Introduction

Tomato (*Solanum lycopersicon L.*), is the most popular and widely grown vegetable in the world. Production of tomatoes is a source of livelihood for young men and women in both the rural and urban centers in Ghana and worldwide (Tshiala and Olwoch, 2010). In terms of health, it contains large quantity of water, calcium, niacin and a good source of vitamins A, C and E which are of great importance in the metabolic activities of man (Olaniyi et al., 2010). In spite of the economic importance and health benefits of tomatoes, farmers in Ghana have been recording low yields. The current average yield of 7.5 t ha-1 is far below the achievable yield of 15 t ha-1 (MoFA, 2011). Consequently, local production does not meet the domestic demand, and so tomatoes are imported from Burkina Faso which affects the economy (MoFA, 2011; Osei et al., 2012). This wide yield gap of tomato in Ghana is due to a number of constraints which include biotic and abiotic factors. The abiotic factors include erratic rainfall, high temperature, and poor soils, among others while the biotic factors include diseases such as Tomato yellow leaf curl virus (TYLCV), Tomato mosaic virus (TMV), bacterial wilt, bacterial spot and early blight (Asante et al., 2013). Tomato grown in Liberia is hard due to the acidic and heavy rain fall in the tropical forest. The low production is due to the proper dysfunctionality of Liberian input market and lack of technical know-how among farmers. However, some small smallholder farmers apply cover crop compost and inorganic fertilizers to aid productions of tomato and are constrained by the recommended dosage for their applications to ensure optimum yield. They applied fertilizer arbitrarily (no measurable dosages) which eventually affects the productivity of tomato (growth and yield); hence the need for this study. Will provide adequate information as to how to apply the recommended application of cow dung and cover crop compost Fertilizers on tomato.

Materials and Methods

The tomato was purchase from Gbarnga Central Market. The research consists of three different treatment levels as given below.

Treatment	Levels
T1	4,000kg/ha; cow dung
T2	4,000kg/ha cover crop compost
T3	0kg/ha – Control

Four plants from each plot were randomly selected for the recording of the observations. Data were collected on the vine length (plant height cm), the number of leaves per plant, leave width (cm), leave length (cm), and stem diameter (cm), fruit diameter, and number of fruit per plant. Data were collected three times in every 14 days interval. Data were subjected to SPSS

(Statistical Product for Service Solutions) version 16 using analysis of variance (ANOVA) to separate mean at P> 0.05. The results are presented in tables and bar chart.

Results

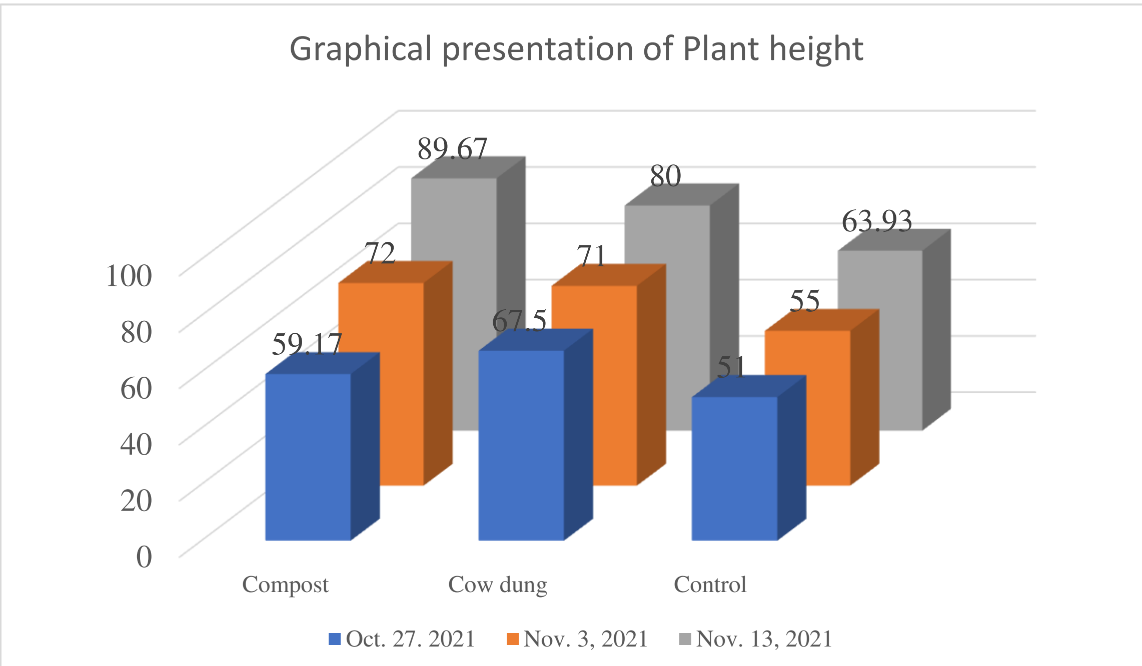

Figure 1 Plant Height

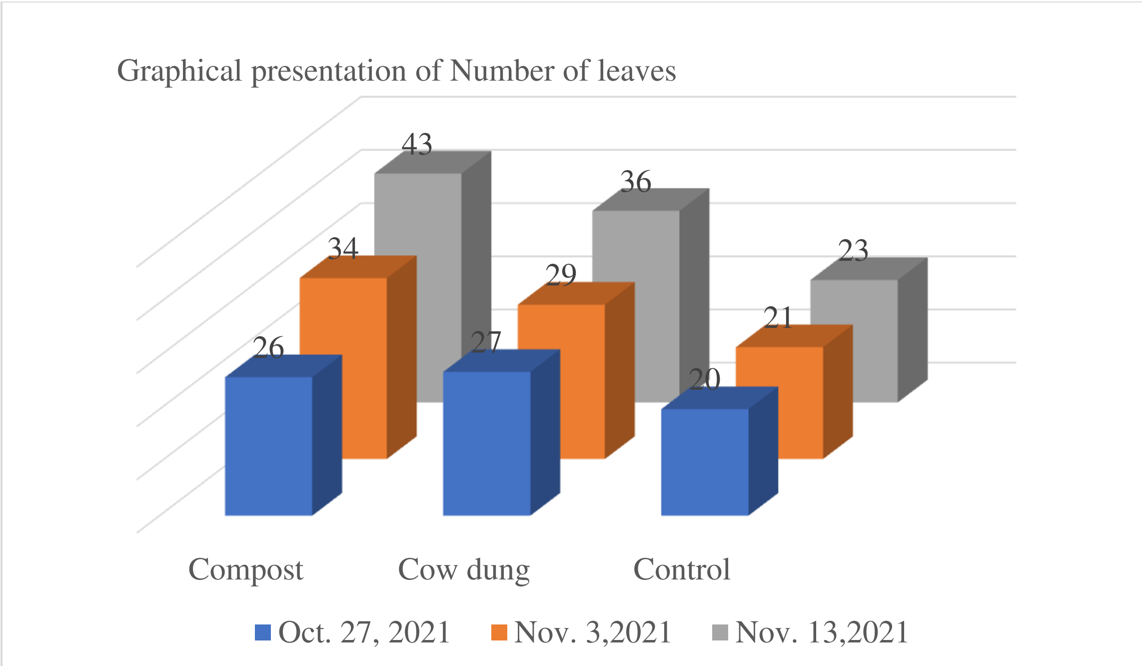

Figure 2 number of leaves per plant

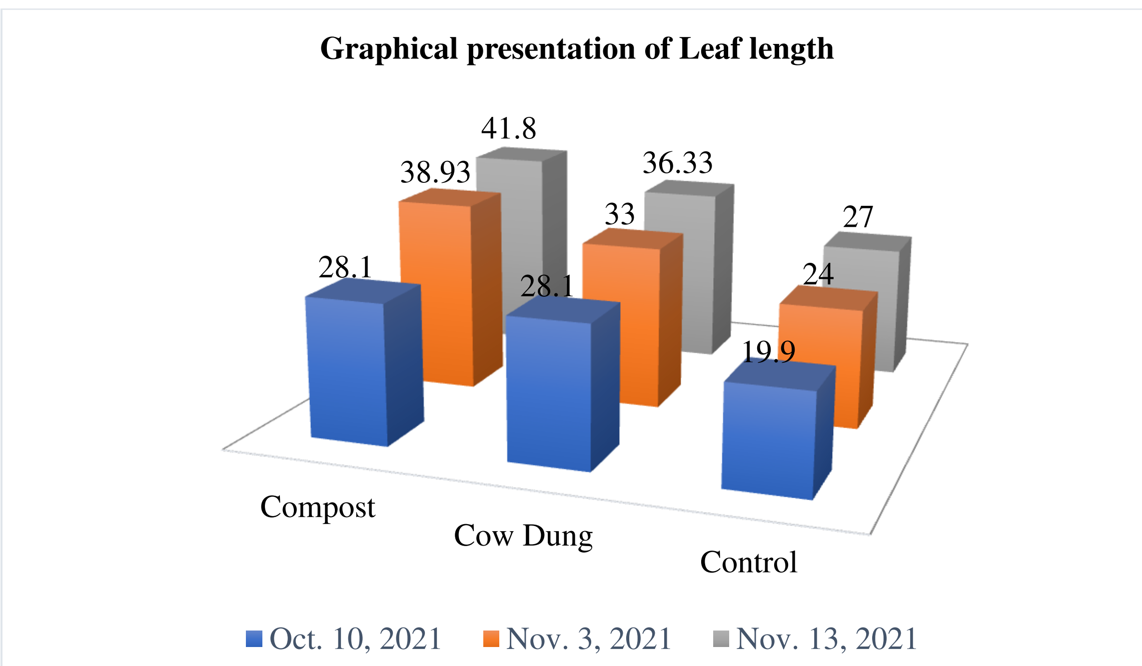

Figure 3 leaf length

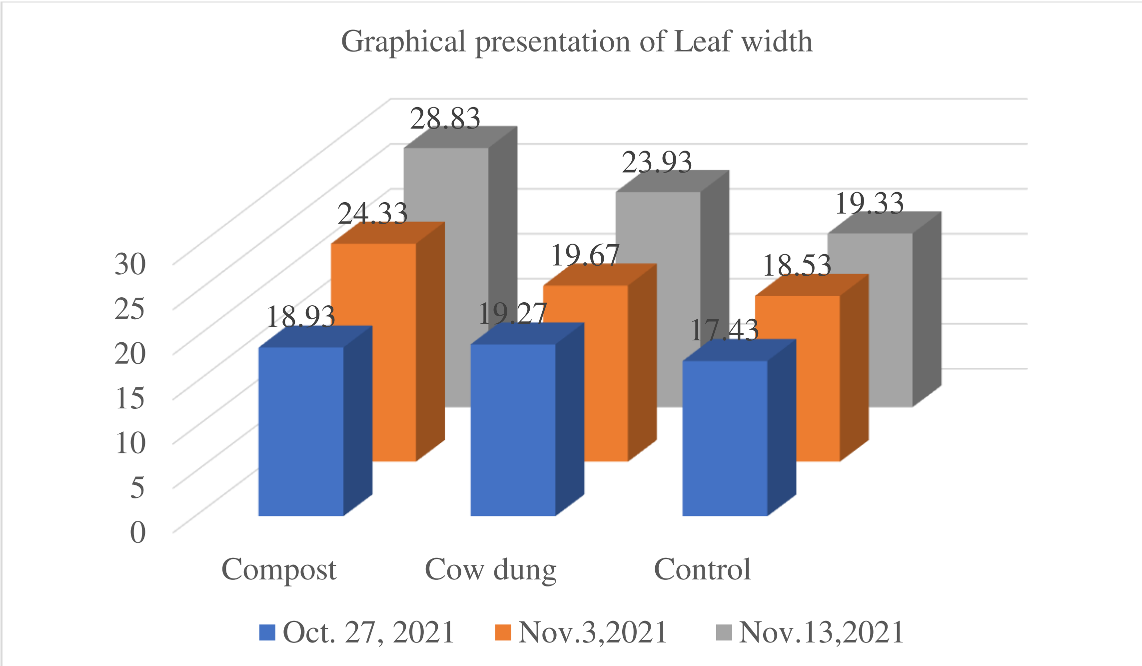

Figure 4 leaf width

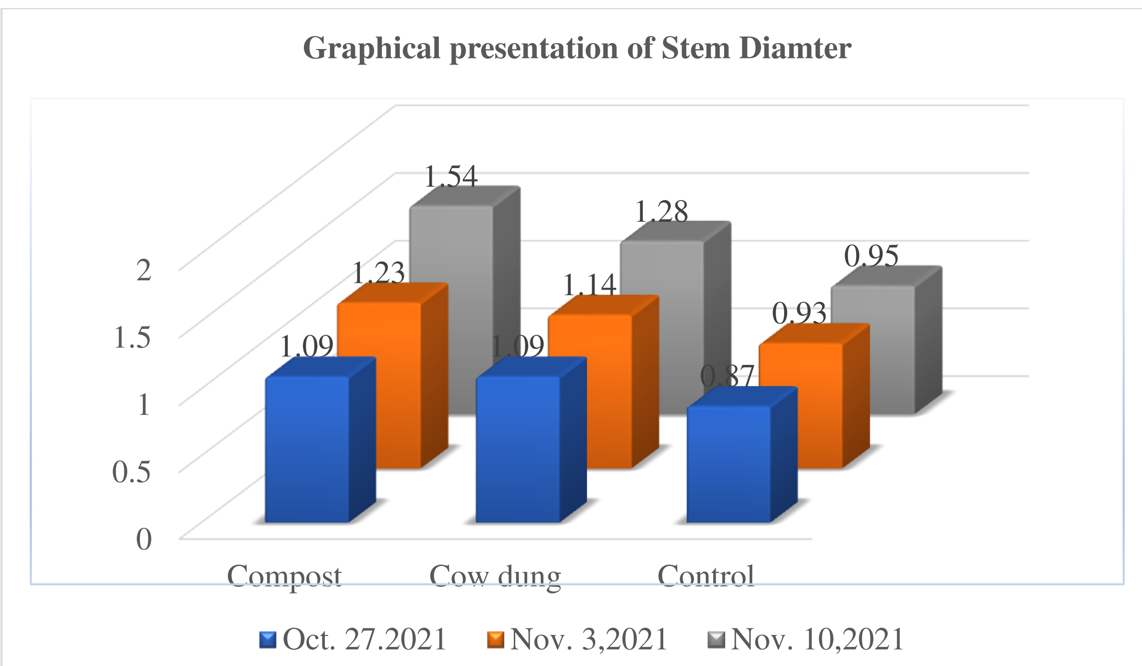

Figure 5 Stem Diameter

Table 1 ANOVA table for leaf width

Leaf width					

Source	Sum of Squares	df	Mean Square	F	Sig.
Treatments	144.305	2	72.153	3.737	.039
Error	463.417	24	19.309		
Total	607.722	26			

Discussions

Figure 1 simplifies the growth data for tomatoes planted in an experimental field to examine the impact of compost and cow dung applications on growth of plant in regards to height. The results revealed that the tallest plant height was obtained in cow dung plots, with a mean of 67.5 cm for the first data gathered, and the shortest plant height was recorded at control plots, with a mean of 51 cm. The second set of data revealed that the compost plot had the longest plant height mean of 72 cm, while the control plot had the shortest plant height mean of 55 cm. The third set of data revealed that the longest plant height means in compost plots was 89.67 cm, while the shortest plant height means in control plots was 63.93 cm. Similar result as seen in Nada, R.S. et. al. 2022.

Figure 2 illuminates the growth data for tomatoes planted in an experimental field to observe the impact of compost and cow dung application on growth of number of leaves per plant. The results revealed that the highest leaves were obtained in cow dung plots, with a mean of 27 for the first data gathered, and the least number of leaves was recorded at control plots, with a mean of 20. The second set of data revealed that the compost plot had the highest number of leaves mean of 34 cm, while the control plot had the least number of leaves mean of 21. The third set of data revealed that the highest number of leaves mean in compost plots was 43, while the least mean in control plots was 23. Said result consented with a research conducted by Asfaw, M. D. 2022.

Figure 3 illuminates the growth data for tomatoes planted in an experimental field to observe the impact of compost and cow dung application on growth level of leaf length. The results revealed that the longest leaf length was obtained in the compost and cow dung plots, with a mean of 28.1 cm respectively for the first data gathered, and the shortest leaf length was recorded at control plots, with a mean of 19.9 cm. The second set of data revealed that the compost plot had the longest leaf length mean of 38.93 cm, while the control plot had the shortest leaf length mean of 24 cm. The third set of data revealed that the longest leaf length mean in compost plots was 41.8 cm, while the shortest leaf length mean in control plots was 27 cm. this result agreed with a study concluded by Muthiani, N. 2021.

Figure 4 indicates the growth data for tomatoes planted in an experimental field to monitor the impact of compost and cow dung application on growth rate of leaf width. The results revealed that the widest leaf width was obtained in compost plots, with a mean of 18.93 cm for the first data gathered, while the smallest leaf width mean of 11.43 cm. The second set of data revealed that the compost plot had the widest leaf width mean of 24.33 cm, while the control plot had the shortest leaf width mean of 18.53 cm. The third set of data revealed that the widest leaf width mean in sugar cane compost plots was 28.83 cm, while the shortest leaf width mean in control plots was 19.33 cm.

Figure 5 indicates the growth data for tomatoes planted in an experimental field to monitor the impact of compost and cow dung application on growth rate of stem diameter. The results revealed that the biggest stem diameter was obtained in the compost and cow dung plots, with a mean of 1.09 cm respectively for the first data gathered while the smallest stem diameter in the control with a mean of 0.87 cm. The second set of data revealed that the compost plot had the biggest stem diameter mean of 1.23 cm, while the control plot had the smallest stem diameter mean of 0.93 cm. The third set of data revealed that the biggest stem diameter mean in compost plots was 1.54 cm, while the smallest stem diameter mean in control plots was 0.95 cm.

Table 1 illustrates the analysis of variance for leaf width. The table shows a significant difference between the various treatments administered since the p-value of .039 is less than 0.05 which was tested at a 95% confident interval. This statistical analysis reveals that the compost and cow dung, had significant difference statistically for leaf width. Similar result consented with Gaydaybu et. al. 2019.

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