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The Effects of Compost and Farmyard Manures on the Growth, Yield and Yield Parameters of Sweet Pepper (*Capsicum annum* L.) in Yola, Adamawa State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author IA designed the study, performed the statistical analysis, wrote the protocol and first draft of the manuscript. Authors ZB and JBA managed the analyses of the study. Authors IA and ZB managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Field experiment was conducted during the 2016 and 2017 raining season in the Teaching and Research Farm of the Department of Crop Production, Modibbo Adama University of Technology Yola, Adamawa State. The experiment was designed to study the effect of compost and farmyard manure on growth yield and yield parameters of sweet pepper (*capsicum annum* L.) in Yola, Adamawa state. Eight purposes of study, eight research questions and two hypotheses were formulated for the study. The research was an experimental design with three treatments and three replicate. Factorial application of 6 kg of each manure was used for 2500 m^2 (0.25 ha) after two weeks of transplanting except in the case of control group which is 0 kg application. All data

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collected were measured and subjected to analysis of variance (ANOVA) appropriate to complete randomized block design (RCBD). The result shows that there was significant effect of farmyard manure in the growth and yield parameters of sweet pepper such as plant height, number of leaves, number of branches and stem girth at two, four and six weeks after transplanting (WAT) and number of fruits, length of fruits, diameter of fruits and fruits weight at one, two, and three weeks of harvest with regard to the effect of compost manure, which shows least significant different in the growth and yield of sweet pepper (*Capsicum annum* L.) in Adamawa state.

Keywords: Sweet pepper; compost; farmyard; manure; growth; yield.

1. INTRODUCTION

Sweet pepper is one of the most varied and widely used foods in Nigeria, Its fruits are harvested and consumed at different maturity stages; green, red and not fully ripe. Sweet pepper (*Capsicum annum* L.) is a very important vegetable in the tropics and in the world and is second most important vegetable after tomatoes [1]. According to Alabi [2], sweet pepper has increased in value and importance over time, making it an indispensible part of the daily diet of millions of Nigeria. Sweet Pepper is normally used as a spice in the preparation of soup and stew when cooked with tomatoes and onion. It can also be used in flavorings of processed meat, colouring certain food preparation and also used for medicinal purpose. Muhamman and Auwalu [3] reported that sweet pepper contribute substantially to Nigerian diet, it is a good source of vitamin A, B1, B2, C, D and E. Also obtained from sweet pepper are potassium, phosphorus, and calcium. Pepper are used in making vegetable curry, salad, etc. and as well has various medicinal values, used in the treatment of paralysis, fever, etc. [4]. Sweet pepper fruit are consumed in fresh, dried or processed form. Sweet pepper can be eaten raw in salad, but more commonly cooked.

Sweet pepper can be grown in tropics, preferably with a rainfall of 600-1200 mm. It is sensitive to water logging and excessive rain. A sandy loam soil which holds moisture fairly well with liberal supply of organic matter is ideal for growth of sweet pepper. The yield of sweet pepper is low in Nigeria due to low soil fertility status which advances as a serious factor. One of the ways of increasing the nutrient status is by boosting the soil nutrient content either with the use of organic matter such as, poultry, animal waste, and use of compost or with the use of inorganic fertilizers [5]. Inorganic manure have necessary amount of the three main nutrients nitrogen, phosphorus and potassium that plant require to survive and flourish. They also release quickly so that the plants are able to get nutrient they need as soon as possible. The use of inorganic manure often leads to decline in soil organic matter content, soil acidification and soil physical degradation, leading to increase soil erosion. On the other hand, inorganic manure is beyond the reach of resource-poor farmers because of high cost and uncertain accessibility.

Organic manure helps to improve the physical condition of the soil porosity and density, thus creating a better plant root, and environment reducing erosion and run off, organic manure has been known to improve biodiversity and long term productivity of soil, and may prove a large depository for excess carbon dioxide. Organic nutrient increases the abundance by providing organic matter and micronutrient for organism such as fungal mycorrhiza. Compost manure is a mixture of various decaying organic substance as dead leaves used for fertilizing the soil [6]. It increases the nutrient status of soil for crop production. Compost manure is produced through the activity of aerobic microorganisms. These microbes require oxygen, moisture, and food in order to grow and multiply. When these factors are maintained at optimal levels, the natural decomposition process is greatly accelerated. The microbes generate heat, water vapour, and carbon dioxide as they transform raw materials into a stable soil conditioner. Compost manure can be produced from many feed stock organic materials, such as leaves, of decomposing solid wastes. The process involves decomposition of organic waste into humus known as compost which is a good fertilizer for plants. Since compost manure contains relatively stable sources organic matter, these nutrients are supplied in a slow-release form. However, compost manure is usually applied at much greater rates; therefore, it can have a significant cumulative effect on nutrient availability. According to Amon and Dell [7], compost manure had a major effect on vegetative growth character of sweet pepper, total yield and quality of the crop.

Farm yard manure is the undigested residue of plant matter which has passed through the animal's gut. According to Akhtar and Malik [8] farm yard manure makes an excellent growing medium for garden plants, vigor of plant and reduces the disease incidence of root rot. Farm yard manure is an important source of nitrogen for crop production in small hold sector. The application of farm yard manure increases soil organic matter content and thus lead to improved water holding capacity. The use of farm yard manure in the garden is a popular practice in many rural areas.

According to Amzad and Yukio [9], utilization of farmyard manure in agriculture is recommended for retaining productivity of problem soils, reducing the usages of chemical fertilizer, improving economy in agriculture and minimizing environmental problems. Farmyard manure is high in nitrogen, carbon, organic matter, some phosphorus, vitamin and minerals. When added to the soil, farmyard manure assist in plant growth and it also add to the nutritive value of the plant.

In order to obtain high yield of sweet pepper there is need to augment the nutrient status of the soil to meet the crop's need and maintaining the fertility of the soil. One of the ways of increasing the nutrient status is by boosting the soil nutrient content either with the use of organic material such as poultry manure, animal waste, and use of compost or with the use of inorganic manure [5]. The present study was conducted to investigate the effect of compost and farmyard manure on sweet pepper (*Capsicum annum* L) on the growth and yield of sweet pepper.

2. MATERIALS AND METHODS

2.1 Experimental Site

Field experiment was conducted at the Teaching and Research Farm of the Department of Crop Production and Horticulture, Modibbo Adama University of Technology Yola, Adamawa State Nigeria during the 2016 and 2017 cropping seasons. Yola lies between latitude 9° and 10´N and longitude 11° and 14 E of the equator at an altitude of 158.5m above sea level.

The experimental field size was 10 m x 8 m and the block size was 2 m x 2 m having 1 m in between blocks and 0.5 m between plot, the site was clear with use of cutlass, hoe and rake, the grasses was raked off and each plot was prepared manually, the same implement was used to further divide the seed beds into twelve equal part for treatment. The experiment was laid out in a randomized complete block design (RCBD) and replicated three times.

2.2 Planting Material

Sweet pepper seed used for the experiment was obtained from the local market in Yola, Adamawa State.

2.3 Cultural Practices

2.3.1 Nursery preparation

Nursery bed was raised 10-15 cm above the level of the ground to prevent the edge for being eroded away during rainy season or by irrigation or outside water from supply into the bed with regular cultivations to keep soils free of weeds.

2.3.2 Transplanting

Sweet pepper was raised in nursery bed for six weeks from seedlings to transplant size, the transplant were healthy, disease free plants and were transplanted by hand. Sweet pepper transplanting was 30 cm within rows and 60 cm between rows. The planting site (nursery) was prepared by incorporating plenty of organic matter to encourage vegetative growth.

2.3.3 Weed control

Hoe weeding and hand pulling was used to control the weed in the field.

2.3.4 Pest and disease control

Wood ash was used to control all kinds of insects. Removal and destruction of the affected plants was used to control the pest and disease.

2.3.5 Method of manure application

Compost manure and farm yard manure were weighed using electric sensitive weighing balance, in the crop production laboratory. Factorial application of 6 kg of each manure was used for 2500 m^2 (0.25 ha) after two weeks of transplanting except in the case of control group which is 0 kg application.

2.3.6 Harvesting

Harvesting of pepper commenced at seven weeks after transplanting by picking method. The fruits harvested were weighed using the sensitive balance.

2.4 Method of Data Collection

A total of 4 plants per plot were used as sample plants for observation and data collection. Data collection was done at two weeks interval. Data was collected on growth and yield parameters.

2.5 Growth Parameters

2.5.1 Plant height

Plat height was measured in centimeters (cm) from four randomly sampled plant using meter rule and rope from the ground level to the tip of the plant at 2, 4, and 6 week interval.

2.5.2 Number of leaves

Number of leaves from the randomly selected plant was counted.

2.5.3 Number of branches

Number of branches from the randomly selected plants was counted at 2, 4, and 6 weeks after transplanting.

2.5.4 Stem girth

Stem girth was measured in centimeters (cm), using a girth tape at the middle of the plant randomly selected at 2, 4, and 6 weeks interval.

2.6 Yield Parameter

2.6.1 Number of fruits

Number of fruit per plot of the three sampled plant was counted at each harvest at eight days interval.

2.6.2 Length of the fruits

The fruit harvested per plot was randomly selected. The length of three fruit from each plot was measured in centimeters (cm).

2.6.3 Diameter of the fruits

The diameter of three randomly selected fruit per selected plot was measured in centimeters (cm) at the middle of the fruit.

2.6.4 Weight of the fruits

Fruit weight was measured per plot using weighing scale in grams (g).

2.7 Method of Data Analysis

The data collected was subjected to analysis of variance (ANOVA) using a statistical package SAS for Windows Release 9.2 (SAS Institute) [10] to test the significant difference between treatments at 0.05 level of significant and. Least significant difference (LSD) was used to separate the difference between means.

3. RESULTS

3.1 Mean Effect of Compost and Farmyard Manure on Plant Height (cm) in 2016 and 2017 Raining Season and Combine

The mean effect of compost and farmyard Manure on plant height in 2016 and 2017 raining season and combine is presented in Table 1. From the analysis of variance, in 2016, there was no significant difference ($P \leq 0.05$) among the treatments at 2 and 6 weeks after transplanting (WAT). From the Table, farmyard manure recorded the highest plant height with 22.80 cm which differ significantly from the rest of the treatments followed by compost which had 22.20 cm. The lowest plant height was recorded from the control treatment which had 18.10 cm. At 4 WAT, farmyard manure recorded significantly higher ($P \leq 0.05$) plant height (34.90 cm), followed by compost which had 30.70 cm. The lowest plant height was recorded from the control treatment 21.30 cm.

In 2017 raining season, there was no significant difference ($P > 0.05$) among the treatments all through the sampled period except at 4 WAT that significant differences ($P \leq 0.05$) were observed among the treatments. At 4 WAT, the highest plant height was also recorded from farmyard manure with 34.50 cm which differ significantly from the rest of the treatment, followed by compost which had 30.40 cm. The lowest was recorded from the control (21.20 cm).

From the combined analysis, there were no significant differences ($P > 0.05$) among the treatments all through the sampled periods except at 4 WAT that significant difference ($P \leq 0.05$) was observed. At 4 WAT, the highest plant height was also recorded from farmyard manure with 34.50 cm which differ significantly from the rest of the treatment, followed by compost which had 30.40 cm. The lowest was recorded from control 21.20 cm.

Table 1. Mean effect of compost and farmyard manure on plant height (cm) in 2016 and 2017 raining season and combine

Treatments	2016			2017			Combine		
	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT
Compost	22.20	30.70	39.90	23.20	30.10	40.90	22.70	30.40	40.40
Farmyard	22.80	34.90	44.80	24.80	34.12	45.80	23.80	34.50	45.30
Control	18.10	21.30	27.60	19.10	21.10	29.80	18.60	21.20	28.70
P<F	0.077	0.017	0.091	0.081	0.020	0.095	0.079	0.019	0.093
LSD	4.460	7.500	16.120	4.462	7.503	16.140	4.461	7.501	16.130

LSD = Least significant difference

3.2 Mean Effect of Compost and Farmyard Manure on Number of Branches in 2016 and 2017 Raining Season

The mean effect of compost and farmyard manure on number of branches in 2016 and 2017 raining season and combine at different sampled period is presented in Table 2. From the analysis of variance in 2016, there was highly significant difference ($P \leq 0.01$) among the treatments. At 2 WAT, farmyard manure recorded the highest number of branches with 4.77 which differ significantly from the rest of the treatment, followed by compost which had 4.75. The lowest was recorded from the control treatment with 3.50 branches. At 4 WAT, farmyard manure also recorded significantly higher ($P \leq 0.05$) number of branches (7.23) and compost manure had 5.63 branches. The lowest number of branches was recorded from the control (3.67).

In 2017 raining season, there was significant difference ($P \leq 0.05$) among the treatments on number of branches all through the sampled period at 2 and 4 WAT. Farmyard manure recorded the highest number of branches with 5.77 which also differ significantly from the rest of the treatment, followed by compost which had 4.81. The lowest number of branches was recorded from the control treatment with 3.53. At 4 WAT, the highest number of branches was recorded from farmyard manure (7.28) followed by compost which had 6.63. The lowest was recorded from the control with 3.70.

From the combine analysis, there was significant difference ($P \leq 0.05$) among the treatments all through the sampled period, except at 6 WAT. The highest number of branches was recorded from farmyard manure with 5.27, followed by compost which had 4.78. The lowest was recorded from the control 3.51. At 4 WAT, the highest number of branches was recorded from recorded from farmyard manure with 7.25, followed by compost which had 6.13. The lowest was recorded from the control (3.68).

3.3 Mean Effect of Compost and Farmyard Manure on Number of Leaves at Different Sampling Periods in 2016 and 2017 Raining Season

The mean effect of compost and farmyard manure on number of leaves in 2016 and 2017 raining season and combine at different sampled period is presented in Table 3. From the analysis of variance in 2016, there was no significant difference ($P > 0.05$) among the treatments at 2 and 6 WAT, except at 4 WAT which was highly significantly different ($P \leq 0.01$). At 4 WAT, farmyard manure recorded the highest number of leaves with 90.40, followed by compost which had 77.70. The lowest was recorded from the control treatment with 46.5 number of leaves.

In 2017 raining season, there was no significant difference ($P > 0.05$) among the treatments all through the sampled period at 2 and 6 WAT. Farmyard manure recorded the highest number of leaves with 90.80, followed by compost (77.10) and the control treatment (48.50).

From the combine analysis, there was no significant difference ($P>0.05$) among the treatments all through the sampled period except in 4 WAT. Farmyard manure recorded the highest number of leaves 90.60, followed by compost (77.4) and the control (47.50).

3.4 Mean Effect of Compost and Farmyard Manure on Stem Girth in 2016 and 2017 Raining Season

The mean effect of compost and farmyard manure on stem girth in 2016 and 2017 raining season and combine at difference sampled

period is presented in Table 4. From the analysis of variance in 2016, there was no significant difference ($P > 0.05$) among the treatments at 2, 4 and 6 WAT. In 2017 raining season, there was no significant difference ($P > 0.05$) among the treatment 2, 4 and 6 WAT. From the combine analysis, there was no significant difference (P≤0.05) among the treatments.

3.5 Mean Effect of Compost and Farmyard Manure on Number of Fruits at Different Harvest Period

Mean effect of Compost and farmyard manure on number of fruits in 2016 and 2017 raining season and combine at different sampled period is presented in Table 5. From the analysis of variance in 2016, there was no significant difference ($P > 0.05$) between the harvest period at 1st and 2nd weeks of harvest except in 3rd week of harvest. Farmyard manure recorded the highest number of fruits (20.23), which differ significantly ($P \leq 0.05$) with the rest of the treatments, followed by compost manure which (19.23) and the control treatment (19.07).

In 2017 raining season, there was no significant difference ($P \leq 0.05$) among the treatment all through the harvest period except at the 3rd week of harvest. The highest number of fruit was recorded from farmyard manure (24.09), followed by compost (21.13) and the control treatment (22.06).

Table 2. Mean effect of compost and farmyard manure on number of branches in 2016 and 2017 raining season and combined analysis at different sampling periods

Treatment	2016			2017			Combine		
	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT
Compost	4.75	5.63	8.17	4.81	6.63	8.19	4.78	6.13	8.18
Farmyard	4.77	7.23	9.10	5.77	7.28	9.16	5.27	7.25	9.13
Control	3.50	3.67	6.83	3.53	3.70	6.89	3.51	3.68	6.86
P<F	0.001	0.027	0.265	0.020	0.028	0.267	0.015	0.026	0.266
LSD	0.360	2.211	3.257	0.360	2.211	3.258	0.360	2.211	3.258

LSD = Least significant difference

Table 3. Mean effect of compost and farmyard manure on number of leaves at different sampling periods in 2016 and 2017 raining season

Treatment	2016			2017			Combine		
	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT
Compost	40.10	77.70	100.10	41.50	77.10	101.10	40.80	77.40	100.60
Farmyard	42.70	90.40	107.30	42.10	90.80	117.30	42.40	90.60	112.30
Control	39.40	46.50	85.30	39.90	48.50	86.30	39.65	47.50	85.80
P <F	0.383	0.007	0.239	0.390	0.017	0.249	0.386	0.012	0.244
LSD	13.680	19.000	30.400	13.680	19.000	30.450	13.680	19.015	30.425

LSD = Least significant difference

Table 4. Mean effect of compost and farmyard manure on stem girth in 2016 and 2017 raining season at different sampling period

Treatment	2016			2017			Combine		
	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT	2nd WAT	4th WAT	6th WAT
Compost	1.32	2.08	2.04	1.32	2.09	2.05	1.32	2.08	2.04
Farmyard	1.57	2.21	2.45	2.47	2.21	3.50	2.02	2.21	2.97
Control	1.61	1.71	2.41	1.61	1.71	2.41	1.61	1.71	2.41
P <F	0.465	0.205	0.107	0.473	0.215	0.110	0.469	0.210	0.108
LSD	0.465	0.656	0.437	0.478	0.679	0.527	0.471	0.667	0.482

LSD = Least significant difference

From the combine analysis, there was no significant difference (P>0.05) among the treatment at different sampled period except in the 3rd week of harvest. Farmyard manure recorded the highest number of fruits with 22.16, followed by compost which had 20.18 and the control treatment with 20.56.

3.6 Mean Effect of Compost and Farmyard Manure on Fruit Length at Different Harvest Period in 2016 and 2017

Mean effects of compost and farmyard manure on fruit length in 2016 and 2017 raining season and combine at different harvest periods is presented in Table 6. From the analysis of variance in 2016 and 2017, there was no significance difference ($P > 0.05$) among the treatments all through the harvest period. Similarly, there was no significant difference ($P > 0.05$) among the treatments all through the harvest periods from the combine analysis.

3.7 Mean Effect of Compost and Farmyard Manure on Fruit Diameter at Different Sampling Period

The mean effect of compost manure and farmyard manure on fruit diameter in 2016 and 2017 raining season and combine at different harvest periods is presented in Table 7. From the analysis of variance in 2016 and 2017, there was no significance difference ($P > 0.05$) among the treatments all through the harvest period. Similarly, there was no significant difference ($P > 0.05$) among the treatments all through the harvest periods from the combine analysis.

3.8 Mean Effect of Compost and Farmyard Manure on Fruits Weight at Different Harvest Period

The Mean effect of compost and farmyard manure on fruit weight in 2016 and 2017 raining season and combine at different harvest periods is presented in Table 8. From the analysis of variance in 2016, there was significant difference ($P \leq 0.01$) among the treatment at the 1st and 2nd week of harvest except in the 3rd week of harvest. Farmyard manure recorded the highest fruit weight (208.00 g) at 1st weeks of harvest, followed by compost which had 160.00 g. The lowest was recorded from control (44.00 g). At the 2nd week of harvest, farmyard manure recorded the highest (166.60 g), followed by compost manure (115.20 g) and the control (62.90 g).

In 2017 raining season, there was significant difference (P≤0.05) among the treatments in the

Table 5. Mean effect of compost and farmyard manure on number of fruits at different harvest period in 2016 and 2017 raining season

Treatment	2016			2017			Combine		
	1st WAH	2nd WAH	3rd WAH	1st WAH	2nd WAH	3rd WAH	1st WAH	2nd WAH	3rd WAH
Compost	13.30	5.69	4.67	15.2	6.78	4.89	14.25	6.235	4.78
Farmyard	20.00	6.67	6.00	21.07	8.77	7.08	20.55	7.72	6.54
Control	9.00	3.33	3.33	9.60	5.45	4.33	9.30	4.39	3.83
P <F	0.285	0.826	0.040	0.292	0.847	0.050	0.285	0.836	0.046
LSD	16.470	5.850	1.851	16.470	5.850	1.863	16.470	5.850	1.857

LSD = Least significant difference

Table 6. Mean effect of compost and farmyard manure on fruit length at different harvest period in 2016 and 2017 raining season

Treatment	2016			2017			Combine		
	1st WAH	2nd WAH	3rd WAH	1st WAH	2nd WAH	3rd WAH	1st WAH	2nd WAH	3rd WAH
Compost	22.30	26.30	19.23	24.60	27.80	21.13	23.45	27.05	20.18
Farmyard	26.70	26.80	20.23	26.90	29.20	24.09	26.80	28.00	22.16
Control	19.23	24.80	19.07	21.33	24.90	22.06	20.28	24.85	20.56
P <F	0.257	0.799	0.224	0.273	0.806	0.322	0.265	0.802	0.273
LSD	9.820	7.860	2.736	9.910	8.720	2.756	9.865	8.290	2.746

LSD = Least significant difference

Table 7. Mean effect of compost and farmyard manure on fruit diameter at different sampling period

Treatment	2016			2017			Combine		
	2nd WAH	4th WAH	6th WAH	2nd WAH	4th WAH	6th WAH	2nd WAH	4th WAH	6th WAH
Compost	19.80	31.20	27.90	22.60	34.10	29.40	21.20	32.65	28.65
Farmyard	24.60	34.40	28.00	26.80	37.30	30.70	25.70	35.85	29.35
Control	17.70	30.70	24.60	19.90	32.80	26.50	18.80	31.75	25.55
P <F	0.148	0.557	0.592	0.155	0.568	0.599	0.152	0.563	0.591
LSD	7.630	9.060	9.910	7.670	9.076	9.918	7.650	9.068	9.914

LSD = Least significant difference

Table 8. Mean effect of compost and farmyard manure on fruits weight at different harvest period

Treatment	2016			2017			Combine		
	2nd WAH	4th WAH	6th WAH	2nd WAH	4th WAH	6th WAH	2nd WAH	4th WAH	6th WAH
Compost	160.00	115.20	59.10	175.00	122.20	67.20	167.50	118.70	63.15
Farmyard	208.00	166.60	65.40	220.00	199.50	72.60	214.00	180.05	69.00
Control	44.00	62.90	31.10	50.00	67.10	34.30	47.00	65.00	32.70
P <F	0.050	0.021	0.114	0.050	0.028	0.118	0.050	0.024	0.116
LSD	126.800	59.470	36.220	136.800	59.580	36.430	131.800	59.525	36.325

LSD = Least significant difference

1st and 2nd weeks of harvest. At the 1st week of harvest, farmyard manure recorded the highest fruit weight (220.00 g), which differ significantly from the rest of the treatment, followed by compost which had 175.00 g and the control treatment with 50.00 g. At the 2nd week of harvest, farmyard manure recorded the highest fruit weight (199.50 g), followed by compost which had 122.20 g, and the control treatment with 67.10 g.

From the combine analysis, there was significant difference (P≤ 0.005) in the 1st and 2nd weeks of harvest period. Farmyard manure recorded the highest fruit weight 180.05 g, followed by compost which had 118.70 g. The lowest was recorded from the control treatment with 32.70 g. At the 2nd week of harvest, farmyard manure recorded the highest fruit weight 214.00 g, followed by compost which had 167.50 g. The lowest was recorded from the control with 47.00 g.

4. DISCUSSION

Plant growth is enhanced by different growth factors such as soil moisture availability, abundant of supplies nutrient, temperature, etc. In this experiment, effect of compost and farmyard manure on growth, yield and yield parameters of sweet pepper (*Capsicum annum* L.) in Adamawa state was studied. Farmyard manure recorded the highest growth parameter such as plant height, number of branches, number of leaves and stem girth, with the application 6 kg/2500 m^2. This is in line with Ewolu et al., [11] who reported that growth parameters such as plant height, number of branches, number of leaves and stem girth were increased with the application of farmyard manure. Lekasi et al. [12] also reported that it is advantageous if the organic matter such as farmyard manure added to the soil mineralize to release nutrients slowly and the rate of nutrients mineralization increases as the plant growth progresses. As the plant matures, it is expected that a good soil would have released adequate nutrient for optimum plant growth. The results also agrees with the findings of Osundare [13], who observed that farmyard manure is rich in nitrogen, phosphorus and potassium which are essential for growth and development of vegetable crops such as sweet pepper. Bhaskarrao et al. [14] also reported that, the application of farmyard manure at 15 t/ha showed significant growth over the inorganic fertilizer (urea and potassium chloride) in terms of germination percentage, fresh and dry weight, plant height, shoot length and root length as well as number of leaves in legume plants.

In the yield analysis, the result shows that 6 kg/2500 m^2 of farmyard manure produces the highest yield parameters such as fruit weight, which is in line with the report of Gudugi [15]. The highest fruit weight was obtained with farmyard manure at 20 t/ha. Bhaskarrao et al. [14] reported that application of farmyard manure at 15 t/ha showed significant growth on plant height, as well as number of leaves. The growth parameter such as plant height, leaf area and number of leaves showed increasing response to all the treatment as the rates increased. Amos et al. [16] reported that growth and yield parameter and final yields all increased significantly ($p \leq 0.05$) with additional rate of cattle manure. Results of this study was not in line with Amon and Dell [7] who reported that compost manure had a major effect on vegetation growth character of sweet pepper, total yield and quality of the fruit, and Shelien et al. [17] who reported that using compost produced the highest maximum early, total yield of sweet pepper.

5. CONCLUSION

With this finding, it is concluded that 6 kg/2500 m^2 (6 kg/0.25 ha) of farmyard manure had significant effect on the growth, yield and yield parameters of sweet pepper, with regard to the compost which has least significant effect on growth and yield parameters of sweet pepper (*Capsicum annum* L.) in Adamawa State. Farmers should adopt the use of organic manure to increase growth and yield of their vegetable crops because of it less cost and availability. When heavy rainfall was experienced during crop production, hand pulling of weed should also be adopted to control the weed.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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