RESPONSE OF AFRICAN EGGPLANT (*Solanum aethiopicum* L.) VARIETIES TO COMPOST TEA IN SUDAN SAVANNA AGRO-ECOLOGICAL ZONE OF NIGERIA

ABSTRACT

Field trial was conducted during the rainy season of 2021 and dry season of 2021/2022 at Teaching and Research Farm of Bayero University Kano (latitude 11^0 58' N and longitude 8^0 26' E, 475m above sea level) in Sudan savannah region of Nigeria to study the response of African eggplant (*Solanum aethiopicum* L.) varieties to compost tea. The treatment consisted of two variety of African eggplant (Bello and F1 Djamba) and three rates of compost tea (0, 50 and 100 litre ha^{-1}). The treatments were laid out in a Randomized Complete Block Design (RCBD) and replicated three times. The compost tea was applied in two equal split doses at 10 and 25 days after transplanting as soil drench. Data were collected on growth and yield attributes. Significant effects of variety and compost tea were observed on plant height, number of leaves, number of branches, leaf area index, total dry matter, net assimilation rate, days to 50% flowering, number of fruits, fruit diameter and fruit yield per hectare. The variety F1 Djamba produced higher fruits yield (3482.3kg ha^{-1}) than Bello variety (2873.3kg ha^{-1}). Similarly, compost tea at100litre ha^{-1} recorded higher fruit yield (3525.5kg ha^{-1}) than the other rates. The significant interactions between eggplant varieties and compost tea on total dry matter, net assimilation rate, days to 50% flowering, number of fruits per plant and fruit yield were also recorded. For the combined season, application of compost tea at 100litre ha^{-1} on F1 Djamba variety (4118.8kg ha^{-1}) resulted in higher fruit yield of eggplant variety. Therefore, the application of 50 -100 litres of compost tea on F1 Djamba variety of eggplant is recommended to farmers in the study area.

Keywords: African eggplant, variety, compost tea, response, Sudan savanna

INTRODUCTION

The African eggplant (*Solanum aethiopicum*) belongs to the family *Solanaceae*, and is one of the five most important vegetables of tropical Africa, together with tomato, onion, pepper and okra (Lim, 2015). Eggplants are used for both food and medicinal purposes, the immature fruits are used as cooked vegetables or sometimes eaten raw, and leaves and shoots can also be cooked as vegetables. Also, the fruits, leaves, and roots of bitter cultivars are used as medicine to treat ailments (Sunseri *et al*., 2010; Adeniji and Aloyce, 2012). African eggplant consumption has a lot of health benefits including effectiveness in blood cholesterol reduction, positive help in heart problems and weight loss (Muanya, 2009). It has proven to be beneficial to patients suffering from anaemia because of its rich iron content and low in vitamin C as compared to tomato (Okon *et al*., 2010), and also contains some appreciable amount of calcium. Eggplant fruits have fibre content, calcium, iron, carbohydrates and β-carotene compared to most vegetables fruit (Eze and Kanu 2014). It is good for balancing diets that are heavy in protein and starches.

Among the important horticultural crops in Africa is African eggplant, but its yields in small holder production systems are far below the crop's potential. This is attributed to a number of yields reducing factors which include both biotic (birds, insects, weeds, fungi) and abiotic (soil, climatic factors, topography) factors. Sustainable agriculture is nowadays an urgent requirement to minimize environmental pollution that has increased as a result of inadequate agricultural practices which involved extensive use of inorganic mineral fertilizers. The challenge of sustainable agriculture is more serious in developing countries, including Nigeria. Inorganic fertilizers are important source of plant nutrients; however, they are source of potential soil pollution particularly mineral-nitrogen and mineral-phosphorus fertilizers (Anyaegbu, 2014). In addition, farmers are suffering from declining soil fertility and increasing soil salinization, and consequently management of poor soil fertility in arid and semi-arid regions needs effective solutions. This is due to excessive use of mineral fertilizers, low rainfall, high evaporation rate, poor irrigation water and poor water management in these regions (Rady *et al.*, 2013). Many studies have raised concerns about increase usage of inorganic fertilizer to increase yields, this has led to increased consumer awareness and shift towards purchase of organically produced food products. In organic farming, growers refrain from use of chemical fertilizers, pesticides, herbicides or other synthetic chemicals during production, processing and storage (Bilal *et al.*, 2015).

Fertility of soil in Sudan Savanna is very important for successful cultivation, making application of fertilizers and manures to soil imperative. The dependency on the use of inorganic fertilizers as source of plant nutrients by farmers and their high cost is associated with land and soil degradation and environmental pollution (Phiri, 2010). In Sudan savanna of northern Nigeria, farmers are highly dependent on inorganic fertilizers as a source of plant nutrients, and frequent application of chemical fertilizers is associated with soil degradation. Therefore, in order to improve plant and soil health, there is need for alternative, eco-friendly and safe source of nutrients for crop production. In recent years, the use of organic fertilizers or biostimulants that can be applied to improve vegetable crop production is receiving more attention. Biostimulants are becoming more importantt for their possible use in organic and sustainable agriculture to avoid excessive fertilizer applications (Tarantino *et al*., 2015).

The use of compost is a natural and ecological means of improving soil fertility for improved crop yield (Agbo *et al.*, 2012). Little work has been done to assess nutritional benefits of compost teas on plant growth, but reports suggested that it increases crop growth and yield especially in vegetable crops (Pant *et. al.*, 2012). Thus, production of crops under soil application with compost tea as an alternative to mineral fertilizers has the potential to increase crop productivity and soil fertility and sustainability (Abdelhamid *et al*., 2004). These practices promoted plant growth and productivity, and healthier human nutrition (Mostafa *et al*., 2016). It will also reduce mineral fertilizer use which lead to environmental pollution and reducing crop production cost and indirectly increases farmer's income (Rady, 2011). Compost teas are oxygenated extracts of compost that has positives effects on crops because they contain bioactive molecules and microorganisms that improved plant growth and health (Morales-Corts *et al.*, 2018). Compost tea improved physiological and nutritional status of plant, and also showed positive effect both on biological control of disease and stimulating plant growth, with subsequent improvement of quantity and quality of crop production (Zaccardelli *et al*., 2012). The benefits derivable therein has led to this study in exploring its nutrients potential for sustainable eggplant production in the study area.

MATERIALS AND METHODS

1. Experimental Site

Field experiments were conducted during the rainy season of 2021 and dry season of 2021/2022 at Bayero University Kano Research Farm (latitude 11^0 58' N and longitude 8^0 26' E; 475 m above sea level) in Sudan savannah region of northern Nigeria to investigate response of African eggplant varieties to compost tea application. The research site is situated in the Sudan Savanna agro-ecological zone of Nigeria, which is characterized by a monomodal rainfall pattern with a mean annual rainfall of 739.80 mm and a daily range of temperature between 17.89oC to 31.83oC.

2. Compost Tea preparation

Compost fertilizer was collected from the Centre for Dryland Agriculture training and research farm and the compost tea was prepared by immersing a burlap sack filled with compost (20kg) into tank containing water, and stirring occasionally. The brewing time lasts for seven (7) days to allow for the release of nutrients.

3. Soil Sample Analysis

Soil samples were randomly collected at various points within experimental plots at 0-30 cm depth using soil auger. The samples were bulked, air dried and subjected to physical and chemical analysis in the laboratory which include; texture, available P, total N, pH, organic carbon and exchangeable bases following standard procedure as suggested by Black (1965).

4. Nursery Bed Preparation

Seedlings were raised in the nursery, with well drained fertile soils. After sowing on seed beds 10cm apart in separate row, the seeds were covered with a thin layer of soil. Watering was done every day in the morning and in the evening, and nursery it lasted for 35 days.

5. Land Preparation

The land was ploughed, harrowed into a fine tilt, and ridged at 75 cm apart and was divided into 18 plots separated by a space of 0.5m between plots and 1m between replications. Gross plot size is 3 m x 3 m ($9m^2$) consisting of 6 rows and net plot size was 1.5m x 1.5m ($3m^2$).

6. Transplanting and Management

Transplanting was done five weeks after sowing in the nursery to the prepared ridges at a spacing of 75 cm between rows and 50 cm between plants to obtain the required plant density. Irrigation was done at 3day interval during dry season. Agronomic practices such as manual hoe weeding (3 and 6WAT), pests and disease control were carried out as at when due. Harvesting was done systematically by hand picking when the crop as attained physiological maturity.

7. Data Collection and Analysis

Data were collected on plant height, number of leaves, number of branches, leaf area index (using leaf area meter, YMJ - A model), total dry matter, net assimilation rate, days to 50% flowering, number of fruits per plant, fruit diameter (using Vanier caliper) and fruit yield (were measured using Metlar MT-2000 sensitive weighing scale, and then extrapolated to per hectare basis) per hectare. Data collected were subjected to Analysis of variance (ANOVA) using Statistical Analysis Software package (SAS version 9.0). Difference among treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

RESULTS

Soil Physical and Chemical Analysis

The results of soil analysis are presented in Table 1. The soil during 2021 rainy season was sandy loam with particle size distributions of 60.9, 25.5 and 13.7% for sand, silt and clay respectively. The soil nutrients status was 0.79% organic carbon, 0.05% nitrogen, 6.88mg kg^{-1} of available phosphorus and 0.10cmol kg^{-1} of potassium. Exchangeable bases were 2.23cmol kg^{-}1 Ca, 2.65cmol kg^{-1} Mg, 0.11cmol kg^{-}1 Na, pH of soil was 5.94 and ECEC was 3.13cmol kg^{-1}. During 2021/2022 dry season, the soil was characterized as sandy loam with particle size distributions of 50.2, 34.6 and 15.2% for sand, silt and clay respectively. The soil nutrients status was 0.65% organic carbon, 0.040% nitrogen, 3.87mg kg $^{-1}$of available phosphorus and potassium 0.13cmol kg^{-1}. Exchangeable bases were 1.74cmol kg^{-1}, 0.75cmol kg^{-1} Mg, 0.09cmol kg^{-1} Na, pH of soil was 5.88, and ECEC was 2.74cmol kg^{-1}

Table1: Physical and Chemical properties of soil at the experimental sites during 2021/2022 rainy and dry season

Properties	Rainy season	Dry season
Physical properties (%)		
Sand	60.9	50.2
Silt	25.5	34.6
Clay	13.7	15.2
Textural class		
Chemical composition		
pH	5.94	5.88
Organic carbon (gkg^{-1})	7.9	0.65
Total Nitrogen (gkg^{-1})	0.49	0.40
Available phosphorus (mgkg^{-1})	6.88	3.87
Exchangeable bases (cmolkg^{-1})		
Ca^{2+}	2.23	1.74
Mg^{2+}	0.65	0.75
K^{+}	0.10	0.13
Na^{+}	0.11	0.09
ECEC	3.13	2.74

Source: Centre for Dryland Agriculture Laboratory, Bayero University Kano.

Plant height (cm)

Table 2 shows effect of variety and compost tea on plant height of African eggplant at 3, 5 and 7 WAT during 2021/2022 rainy, dry and combined seasons. The results showed significant difference between varieties and compost tea on plant height across the sampling periods during the two seasons. The F1 Djamba variety produced significantly taller plants (26.8cm) at 7 WAT than Bello variety (21.5cm) during the rainy season. While at 3 (5.1cm) and 5 (9.2cm) WAT in dry season, the variety Bello produced significantly taller plant than the other variety. At combined period, the variety bello recorded the tallest (5.2cm) plant at 3 WAT while the F1 Djamba recorded the tallest plant (21.4cm) at 7 WAT.

Similarly, application of 50-100litre ha^{-1} of compost tea resulted in significantly taller plants than 0litre ha^{-1} (with no application) which recorded shorter plant during the two seasons and combined periods.

No significant effect of interaction of variety and compost tea on plant height across all sampling periods during the two seasons and combined periods was observed during the study.

Table 2: Plant height of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

	Rainy season			Dry season			Combined season		
Treatment	3	5	7	3	5	7	3	5	7
Variety V									
Bello	5.3	10.7	21.5b	5.1a	9.2a	16.9	5.2a	9.9	19.2b
F1 Djamba	5.1	11.5	26.8a	4.3b	8.1b	15.9	4.7b	9.8	21.4a
SE±	0.149	0.346	0.651	0.246	0.283	0.607	0.143	0.225	0.451
Compost C (l/ha)									
0	4.8b	9.5b	23.0	4.4	7.4c	14.1b	4.6b	8.5c	18.6b
50	5.3a	12.3a	24.7	4.8	9.8a	18.5a	5.1ab	11.1a	21.6a
100	5.6a	11.4a	24.8	4.8	8.7b	16.5a	5.2a	10.0b	20.7a
SE±	0.183	0.424	0.798	0.301	0.346	0.743	0.175	0.275	0.552
Interaction									
V*C	0.5924	0.0891	0.3401	0.9678	0.2318	0.7834	0.7889	0.0586	0.3580

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT

Number of leaves

The effect of variety and compost tea on number of leaves of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons is shown in table 3. During the rainy season, there were no significant differences in number of leaves produced by the two eggplant varieties except at 7WAT where F1 Djamba produced significantly more leaves (27.6) than Bello (21.9) variety. However, during the dry season and combined periods, Bello variety recorded significantly more leaves than F1 Djamba. Application of 50-100litre/ha of compost tea resulted in higher number of leaves, while lowest number of leaves was obtained from control (0litre/ha) across all sampling periods during the two seasons and combined period. There were no significant effect of variety and compost tea interaction on number leaves produced during the two season and combined period across all sampling periods.

Table 3: Number of leaves of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

	Rainy season			Dry season			Combined season		
Treatment	3	5	7	3	5	7	3	5	7
Variety V									
Bello	3.9	11.4	21.9b	5.2a	12.3a	21.6a	4.6a	11.8	21.8

F1 Djamba	4.2	12.2	27.6a	4.4b	9.9b	17.9b	4.3b	11.0	22.7
SE+	0.106	0.658	0.886	0.152	0.399	0.730	0.092	0.381	0.571
Compost C (l/ha)									
0	4.3	10.4b	22.0b	4.4b	9.9b	18.9	4.3	10.1b	20.5b
50	3.9	11.6ab	25.9a	4.8ab	11.5a	20.4	4.4	11.6a	23.1a
100	4.0	13.4a	26.3a	5.2a	11.8a	20.0	4.6	12.6a	23.1a
SE+	0.130	0.806	1.085	0.186	0.489	0.894	0.113	0.467	0.700
Interaction									
V*C	0.9030	0.9421	0.1082	0.6281	0.1277	0.3553	0.7549	0.4452	0.1569

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT

Number of branches

Table 4 shows effect of variety and compost tea on number of branches of African eggplant varieties at 5 and 7 WAT at BUK during 2021/2022 rainy, dry and combined seasons. The results show that F1 Djamba produced significantly higher number of branches at 5 (3.3) and 7 (6.4) WAT than Bello variety during the rainy season, while Bello variety resulted in greater number of branches at 5 (3.1) and 7 (5.8) WAT than F1 Djamba during the dry season. However, similar number of branches was recorded from the two varieties during the combined season. Application of 50-100litre/ha of compost across all sampling periods during the two season and combined periods resulted in higher number of branches, while the lowest number was recorded from the control (0litre/ha).

Table 4: Number of branches of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

	Rainy season		Dry season		Combined season	
Treatment	5	7	5	7	5	7
Variety V						
Bello	2.6b	4.6b	3.1a	5.8a	2.9	5.2
F1 Djamba	3.3a	6.4a	2.2b	4.6b	2.8	5.5
SE+	0.200	0.200	0.130	0.176	0.118	0.132
Compost C (l/ha)						
0	2.7	4.6b	2.4	4.9b	2.6	4.8b
50	3.1	6.0a	2.7	5.2ab	2.9	5.6a
100	3.0	5.9a	2.8	5.5a	2.9	5.7a
SE+	0.245	0.245	0.159	0.215	0.145	0.162
Interaction						
V*C	0.6089	0.0624	0.3331	0.2663	0.5358	0.5449

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT

Leaf area index

The effect of variety and compost tea on leaf area index of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons is shown in table 5. The result revealed that F1 Djamba produced larger leaves at 7 WAT (0.024) during rainy season than Bello (0.020) variety, while during the dry season and combined period, it was Bello variety that recorded larger leaves at 3 (0.008) and 7WAT (0.018) than F1 Djamba. Significantly larger leaves were exhibited by application of 50-100litre/ha of compost tea at the two season and combined period across all sampling periods, while smaller leaves were recorded from control (0litre/ha) during the same periods. There was no significant effect of variety and compost tea interaction on leaf area index during same periods at all sampling levels.

Table 5: Leaf area index of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

	Rainy season			Dry season			Combined season		
Treatment	3	5	7	3	5	7	3	5	7
Variety V									
Bello	0.009	0.015	0.020b	0.008a	0.013	0.018a	0.008a	0.014	0.019
F1 Djamba	0.008	0.017	0.024a	0.006b	0.012	0.016b	0.007b	0.015	0.020
SE±	0.0006	0.0009	0.0008	0.0004	0.0005	0.0006	0.0003	0.0005	0.0005
Compost C (l/ha)									
0	0.007b	0.016	0.019b	0.006	0.012b	0.016b	0.007	0.014	0.018b
50	0.010a	0.017	0.025a	0.007	0.013ab	0.17ab	0.008	0.015	0.020a
100	0.008b	0.016	0.022a	0.007	0.014a	0.018a	0.008	0.015	0.020a
SE±	0.0007	0.0011	0.0010	0.0005	0.0006	0.0007	0.0004	0.0006	0.0006
Interaction									
V*C	0.2498	0.5510	0.2713	0.3418	0.2631	0.3149	0.0883	0.2652	0.1329

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT

Total dry matter

The influence of variety and application of compost tea on African eggplant total dry matter at 3, 5 and 7WAT at BUK during 2021/2022 rainy and dry seasons is presented in table 6. The findings showed that F1 Djamba produced more dry matter than Bello variety at all sampling periods during the two season and combined season. Similarly, application of 50 and 100litre/ha of compost tea resulted in larger amounts of total dry matter in comparison with no application (0litre/ha) which recorded lowest amount of total dry across all sampling periods during the two season and combined season respectively. There was significant effect of variety and compost tea interaction on total dry matter of African eggplant at 7WAT during the combined period as presented in table 7, with application of 50litre/ha compost tea in combination with F1 Djamba producing noticeably larger amount of total dry matter than other interactions during the period.

Table 6: Total dry matter of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

	Rainy season			Dry season			Combined season		
Treatment	3	5	7	3	5	7	3	5	7
Variety V									
Bello	5.6b	19.9b	22.8b	4.8b	17.3b	20.2	5.2b	18.6b	21.5b
F1 Djamba	9.1a	26.8a	34.9a	6.1a	19.4a	22.0	7.6a	23.1a	28.5a
SE±	0.290	0.528	1.564	0.175	0.614	0.647	0.168	0.405	0.846
Compost C (l/ha)									
0	5.0b	19.4b	21.7b	3.9c	14.9b	18.3b	4.5c	17.2b	20.0b
50	8.3a	25.6a	34.4a	5.8b	19.9a	22.2a	7.1b	22.8a	28.3a
100	8.8a	25.2a	30.5a	6.8a	20.1a	22.9a	7.8a	22.6a	26.7a
SE±	0.355	0.647	1.916	0.215	0.752	0.792	0.206	0.496	1.036
Interaction									
V*C	0.1810	0.0700	0.0708	0.0580	0.1839	0.3145	0.0532	0.0823	0.0038**

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT, **= F-value significant at (P≤0.01)

Table 7: Interaction of variety and compost tea on total dry matter (gm) of African eggplant 7WAT at BUK during 2021/2022 combined season

	Compost tea (litre/ha)		
Treatment	0	50	100
Variety			
Bello	18.8d	22.2cd	23.6c
F1 Djamba	21.1cd	34.5a	29.7b
SE±		1.465	

Means followed by same letter(s) in the same column and row are not different statistically at *P=0.05* level of probability using DMRT

Net assimilation rate

Table 8 showed effect of variety and compost tea on net assimilation rate of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons. Significantly higher amount of assimilates were produced from F1 Djamba than Bello variety at all sampling periods during both season and combined periods. Similarly, application of 50litre/ha of compost tea at all sampling periods resulted in larger amount of assimilates, while the control (0litre/ha) recorded the lowest amount of assimilates during the two season and combined periods. There was significant effect of variety and compost tea interaction on net assimilation at 5-7WAT for the combined season, with application of 50litre/ha compost tea in combination with F1 Djamba having higher amount of assimilates compared to other interaction combinations during the period as presented in table 9.

Table 8: Net assimilation rate of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

	Rainy season	Dry season	Combined season

Treatment	3-5	5-7	3-5	5-7	3-5	5-7
Variety V						
Bello	0.19b	0.03b	0.17b	0.03	0.18b	0.03b
F1 Djamba	0.24a	0.08a	0.22a	0.03	0.23a	0.05a
SE±	0.015	0.016	0.012	0.002	0.009	0.008
Compost C (l/ha)						
0	0.16b	0.02b	0.15b	0.02	0.16c	0.02b
50	0.27a	0.10a	0.23a	0.03	0.25a	0.06a
100	0.21b	0.04b	0.21a	0.03	0.21b	0.04ab
SE±	0.019	0.020	0.014	0.003	0.012	0.010
Interaction						
V*C	0.0600	0.2460	0.3070	0.2236	0.0543	0.0445*

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT, *= F-value significant at ($P \leq 0.05$)

Table 9: Interaction of variety and compost tea on net assimilation rate ($gg^{-1}wk^{-1}$) of African eggplant 5-7WAT at BUK during 2021/2022 combined season

	Compost tea (litre/ha)		
Treatment	0	50	100
Variety			
Bello	0.017b	0.030b	0.034b
F1 Djamba	0.022b	0.096a	0.037b
SE±		0.014	

Means followed by same letter(s) in the same column and row are not different statistically at *P=0.05* level of probability using DMRT

Number of days to 50% flowering

The effect of variety and compost tea on number of days to 50% flowering of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons is shown in table 10. There was significant difference in number of days to 50% flowering with F1 Djamba taking shorter days (36.6) to flowered compared to Bello variety (39.3) which flowered at a later day during rainy season, while during the dry season, Bello variety flowered earlier (50.3) than F1 Djamba which flowered at a later day (54.3). Significantly earlier flowering was noticed with application of 100litre/ha compost tea compared to 50 and 0litre/ha across the two season and combined period. Similarly, there was significant effect of variety and compost tea interaction on number of days to 50% flowering with application of 100litre/ha compost tea in combination with F1 Djamba (34.7) showing flower onset earlier than other interaction combinations as presented in table 11.

Table 10: Number of days to 50% flowering of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

Treatment	Rainy season	Dry season	Combined season
Variety V			
Bello	39.3a	50.3b	44.8

F1 Djamba	36.6b	54.3a	45.4
SE±	0.367	0.635	0.527
Compost C (l/ha)			
0	38.4a	53.7a	46.0a
50	38.3a	52.3ab	45.3a
100	37.0b	51.0b	44.0b
SE±	0.449	0.778	0.646
Interaction			
V*C	0.0063**	0.1654	0.1692

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT, **= F-value significant at (P≤0.01)

Table 11: Interaction of variety and compost tea on days to 50% flowering of African eggplant at BUK during 2021/2022 rainy season

	Compost tea (litre/ha)		
Treatment	0	50	100
Variety			
Bello	39.9a	39.4a	38.7ab
F1 Djamba	38.2ab	36.8b	34.7c
SE±		0.636	

Means followed by same letter(s) in the same column and row are not different statistically at *P=0.05* level of probability using DMRT

Number of fruits per plant

Table 12 showed the effect of variety and compost tea on number of fruit per plant of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons. There were significant differences in number of fruits produced per plant across the three sampling seasons, with F1 Djamba producing significantly higher number of fruit per plant than Bello variety during the three seasons. Similarly, application of 50litre/ha of compost tea produced significantly higher number of fruit per plant than other rate across the three sampling seasons. The result also indicates significant effect of variety and compost tea interaction on number of fruit per plant during the combined season, with application of 100litre/ha compost tea in combination with F1 Djamba producing higher number (62.5) of fruit per plant than other interaction combinations during the same period as presented in table 13.

Table 12: Number of fruit per plant of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

Treatment	Rainy season	Dry season	Combined season
Variety V			
Bello	31.6b	14.2b	22.9b
F1 Djamba	50.6a	22.8a	36.7a
SE±	3.688	1.660	2.037

Compost C (l/ha)			
0	31.9b	14.4b	23.1b
50	47.3a	21.3a	34.3a
100	44.1ab	19.9ab	32.0a
SE$\pm$	4.517	2.033	2.495
Interaction			
V*C	0.0659	0.0659	0.0039**

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT, **= F-value significant at ($P \leq 0.01$)

Table 13: Interaction of variety and compost tea on number of fruits per plant of African eggplant at BUK during 2021/2022 combined season

	Compost tea (litre/ha)		
Treatment	0	50	100
Variety			
Bello	25.8d	26.2d	42.8bc
F1 Djamba	37.7cd	51.8ab	62.5a
SE$\pm$		4.469	

Means followed by same letter(s) in the same column and row are not different statistically at *P=0.05* level of probability using DMRT

Fruit diameter

Table 14 showed effect of variety and compost tea on fruit diameter of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons. There were no significant differences in fruit diameter obtained from the eggplant varieties during rainy and combined season. However, during dry season, Bello variety produced fruits with broader diameter (37.1) than F1 Djamba that produced fruits with narrow diameter. Similarly, application of 100litre/ha compost tea across the three sampling seasons resulted in fruits with wider diameter than other compost rates. The effect of variety and compost tea interaction on fruit diameter across the three sampling seasons were not significant for all interaction combinations.

Table 14: Fruit diameter (mm) of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

Treatment	Rainy season	Dry season	Combined season
Variety V			
Bello	48.5	37.1a	41.6
F1 Djamba	46.2	33.1b	40.8
SE$\pm$	1.480	1.000	0.890
Compost C (l/ha)			
0	43.5b	32.2b	37.8b
50	47.8ab	35.4ab	41.6a
100	50.8a	37.8a	44.3a

SE+	1.812	1.225	1.091
Interaction			
V*C	0.6237	0.2002	0.4035

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT

Fruit yield per hectare

The effect of variety and compost tea on fruit yield of African eggplant varieties at BUK during 2021/2022 rainy, dry and combined seasons is shown in table 15. Higher fruit yield was obtained from F1 Djamba during rainy (4468.8) and combined (3482.3) seasons than Bello variety with lower fruit yield (2829.9 and 2873.3, respectively). Similarly, 50-100litre/ha of compost tea produced higher fruit yield than control (0litre/ha) across the three sampling periods. Likewise, significant effect of variety and compost tea interaction on fruit yield during rainy season with application of 100litre/ha compost tea in combination with F1 Djamba produced higher fruit yield (62.5) than other interaction combinations as presented in table 16, with no significant effect of interaction on fruit yield observed during dry and combined seasons.

Table 15: Fruit yield (kgha^{-1}) of African eggplant as influenced by variety and compost tea at BUK during 2021/2022 rainy, dry and combined seasons

Treatment	Rainy season	Dry season	Combined season
Variety V			
Bello	2829.9b	2916.7	2873.3b
F1 Djamba	4468.8a	2495.8	3482.3a
SE+	197.624	233.574	157.546
Compost C (l/ha)			
0	3119.8b	2127.1b	2623.4b
50	4250.0a	2518.8b	3384.4a
100	3578.1ab	3472.9a	3525.5a
SE+	242.039	286.068	192.954
Interaction			
V*C	0.0081**	0.5816	0.0563

Means followed by same letter(s) within same column are not different statistically at *P=0.05* level of probability using DMRT, **= F-value significant at ($P \leq 0.01$)

Table 16: Interaction of variety and compost tea on fruit yield/hectare (kgha^{-1}) of African eggplant at BUK during 2021/2022 combined season

	Compost tea (litre/ha)		
Treatment	0	50	100
Variety			
Bello	25.8d	26.2d	42.8bc
F1 Djamba	37.7cd	51.8ab	62.5a
SE+		4.469	

Means followed by same letter(s) in the same column and row are not different statistically at *P=0.05* level of probability using DMRT

DISCUSSION

The results of the study show significant differences in growth and yield attributes of the two African eggplant varieties, with F1 Djamba performing significantly better than Bello variety. This could be attributed to the inherent genetic composition of F1 Djamba in response to favourable growing conditions. This corroborates the findings of Das *et al*. (2018) who observed that genetic make-up of a variety is a determinant of its growth and yield ability. This was further supported by report of other workers that ability of a cultivar or variety to exhibit a better performance in terms of growth and yield potential could be as a result of genetic influence, environment and ecological differences (Abdel-Magwoud *et al.,* 2005; Moniruzzaman *et al.,* 2009 and Sharma *et al.*, 2013).

The significant increase in growth and yield characters of the eggplant varieties in this study with application of 50litre/ha of compost tea could be attributed to presence of beneficial microorganisms which improved plant growth and health (Pane *et al.,* 2014). Compost tea has been successfully used to raise crop productivity and maintain good quality of vegetables, and it has positive effect on soil quality, productivity and enhanced soil microbiology (Musa *et al.,* 2017 and Piya *et al.,* 2018). Addition of compost increase soil nutrient availability and thereby increase nutrient uptake by plants directly, and indirectly through improvement of soil structure and nutrient and water retention favourable to plant growth (Duong, 2013). It is an important component of integrated plant nutrition system, which plays an important role for plant growth, rooting initiation, promoting growth rates of shoots and roots, and crop production improvement (Baniya and Vaidya, 2011; Sundararasu and Jeyasankar, 2014 and Soraya *et al.,* 2020). It will also lead to increase soil organic matter, macro and micro-nutrients for enhancement of soil quality and beneficial soil microbiology serving as biofertilizers and biopesticides. This result also aligned with findings of some workers who reported that garden waste compost and compost treatments significantly influenced vegetative and yield of some vegetables like okra and tomato (Adebayo *et al.,* 2013 and Morales-Corts *et al.,* 2018). This was further corroborated by findings of Bernal *et al.* (2008) who reported significant increase in growth and yield of melon by root treatment of nursery plants with compost extract carrying auxinic-like compound.

There was significant effect of variety and compost tea on growth and yield of the eggplant varieties during the study. F1 Djamba respond to applied compost tea at 50litre/ha better than Bello variety leading to better growth and yield performance. These interactions will improve nutrients availability in soil leading to increased growth and yield. This could probably be attributed to differential response of the varieties to utilize released nutrients from compost as well as favourable environmental conditions. This finding was corroborated by reports of some worker who asserts that varieties of crop respond differentially to different sources of nutrients with respect to growth and yield (Singh *et al.*, 2009; Miheretu and Sarkodie-Addo 2017).

CONCLUSION

The results of the trials showed that F1 Djamba outperformed Bello variety in terms of growth and yield attributes, and this could be attributed to its genetic make-up and superiority, as well as adaptability to growing environment during the growing seasons. The growth and yield characters of the eggplant varieties under study were also greatly enhanced with application of 100litre/ha of compost tea, though at par with application of 50 litres/ha in most cases. Similarly, during the three periods, combination of F1 Djamba with 100litre/ha compost tea resulted to significant increase in growth and yield of eggplant varieties. Therefore, to ensure sustainable eggplant production in the study area, farmers should be encouraged to cultivate F1 Djamba variety during rainy and dry season utilizing between 50-100litre/ha compost tea as organic nutrient source for effective and efficient production.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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