

Effects of Decayed Leaf Litters from Selected Plant Sources (*Terminalia catappa*, *T. mentalis* and *Moringa oleifera*) on the Growth of Eggplant Species

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Abstract

A pot experiment was carried out to ascertain the effects of plant based organic manure (*Terminalia catappa*, *Terminalia mentalis* and *Moringa oleifera*) and inorganic fertilizer (NPK) on the growth performances of selected eggplant species (*Solanum melongena*, *Solanum anguivi* and *Solanum macrocarpon*). The experiment was arranged in a complete randomized design with two replicates. Data obtained were subjected to ANOVA and significant mean were detected using Turkey method ($P < 0.05$). Results on species performance revealed that, *Solanum macrocarpon* outclass others species on application of treatments, this was evidence on Stem circumference, Number of leaves, Leaf length and width, Number of branches and Plant spread at week 5, but significantly lower for trace of disease as compare to *Solanum melongena* and *Solanum anguivi*. *Solanum anguivi* shown significant different for the Number of germination, percentage germination, seedling vigor and Plant spread which was higher as compare to other species. No significant difference were detected among the species for both the organic manure and fertilizer for the Stem circumference, Number of leaves, Plant spread and Trace of disease, 5 weeks after treatment. The effect of manure types on growth of eggplant influenced the Plant height (2WAMA), Plant height (5WAMA), Leaf length (5WAMA), Number of branches (5WAMA) and Plant performance (5WAMA) were significantly different as compare to inorganic fertilizer and the control. Therefore organic manure is recommended for our peasant farmers for optimum performance of eggplant as it is safe, cheap and easily accessible.

Keywords

Decay, Eggplant, Growth Performance, N.P.K and Organic Manure

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1. Introduction

Eggplants also known as Garden egg is one of the major vegetables grown in West Africa and is cultivated in tropical Africa, Asia and America throughout the tropical and subtropical areas [16]. Eggplant species (*S. melongena*, *S. macrocarpon*, *S. anguivi*) are important herbs among vegetable crops that belong to the family

solanaceae and they have variations in fruit shape and colour. It is considered most popular vegetable crop and commercially important in Asia. Fruits of eggplant are known to contain sufficient amount of proteins, vitamins, minerals, starches, dietary fibers and low-fat content and high phenolic compounds [4]. The fruits which can be

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cooked help for digestions, lowering of high blood pressure, preventing constipation. The green leaves are very good aphrodisiac, they are used for arousing and intensifying sexual desires. The leaves are also used as laxative and effective tonic for liver problems [8]. This crop require optimum temperature for growth (22-30°C), its growth could be inhibited by 17°C [1] and can survive and perform well on well drained and wide range of soil types with PH of 5.5-6.5 [10]. Eggplants needs fertile soil for proper growth and yield but the fertility of the soil can be declined or affected by soil erosion, insufficient nutrients, leaching, continuous cropping and loss of nutrients during harvest. Therefore, there is need for application of either inorganic or organic fertilizers in their available form, sufficient amount, proportion and at the correct time for optimum production and positive impact on the phyto-nutritional attributes of the crop [3]. The growth and yield parameters of eggplants also need to be improved so that this crop will be available in the market in no time, there is high demand for eggplants in the society and this is due to the increasing awareness toward the nutritional and health benefit of eggplant in fulfilling the nutritional requirement of the family [13]. Maghfoer *et. al.* [9] have studied the effect of organic and inorganic manure on the vegetative growth, yield and quality of Eggplant. Organic manure treatment of Eggplant or other vegetables strictly excludes the use of inorganic manure and growth regulators. Organic manure plays a vital role in soil fertility, microbial population, improves plant growth by providing micro and macro nutrients in available form, which eventually increases the productivity [6]. Concerning organic manure, many researchers have found that addition of organic manure had a positive impact on the growth, qualitative and quantitative attributes of Eggplant [5]. Vegetable crops are consumed or eaten fresh or even cooked in order to avoid residual effects of chemical fertilizers, organic manure should be preferred for improving food quality and provide health security to the plant and people. Other researchers argued that, organic manure alone cannot meet the nutritional needs of crops because they contain low or less quantity of nutrients compared to inorganic manure. A balanced proportion of organic and inorganic fertilizers are a better approach to soil fertility management [12] or even the combination of different organic sources. The need to integrate or use the two forms in order to achieve better and good crop yields. This interaction may lead to either an increase or decrease in nutrients in the soil and also plant growth and yield depending on the nutrient and plant material in question. This necessitate this study to ascertain the effects of organic and inorganic manure treatments from decayed leaf litters of *Terminalia*

catappa, *T. mentalis* and *Moringa oleifera* and NPK respectively on the growth and yield parameters of three eggplant species (*Solanum melongena*, *S. anguivi* and *S. macrocarpon*).

2. Materials and Methods

2.1. Study Area

The experiment was conducted at the Federal University of Agriculture Makurdi Benue State at the Botanical Garden Site, behind the Department of Botany, Academic Block B from January to March.

2.2. Sample Collection and Identification

The soil used for the experiment was dug from a farmland behind Academic Block B, Department of Botany of the Federal University of Agriculture, Makurdi. Seeds were obtained from harvested fruits of the three eggplant species used for the study. Leaves were obtained from *Terminalia catappa*, *Terminalia mantaly* and *Moringa oleifera* after proper identification. All identification was done by taxonomists in the Department of Botany, Federal University of Agriculture Makurdi.

2.3. Pot Preparation

The soil collected was air dried while larger aggregates were broken down by gentle crushing with wooden pluck [7] and the soil was sieved to remove unwanted particles. Soil samples were transferred into perforated polythene bags. Each pot contained 5.5kg of soil.

2.4. Manure Preparation

Leaves of *Terminalia catappa*, *Terminalia mentalis*, *Moringa oleifera* were shredded and grinded and placed in a container (garbage can), leaves were considered brown in the compost pile. A liberal amount of green materials high in nitrogen such as green clippings and kitchen waste were added to each container containing leaves. The compost pile was mixed 1-2 times a week and more green waste was added as the pile was turned and mixed. Turning the pile and mixing in oxygen enabled it to heat up and compost more quickly. The pile was always kept moist with a consistency of a sponge. The pile was covered with a plastic sheet to keep the pile warm, prevent it from drying out and prevent attracting pests to the compost pile. A regime of regular turning and aerating the pile resulted to high quality leaf compost [2]

2.5. Experimental Design

The experiment was set up in a randomized design structure consisting of eighteen treatment combinations of

decayed leaf litters from three species (*Terminalia catappa*, *T. mentalis*, *Moringa oleifera*) and NPK inorganic fertilizers, each replicated twice (18x3x2) making a total of 108 experimental units. Table 1 gives the eighteen treatment combinations from four treatments used in this study.

2.6. Planting and Treatment Application

The seeds were planted and later thinned to one seedling per stand and plants were watered on alternate days. 18 treatments were applied three weeks after planting.

2.7. Parameters Evaluated

Data were collected three weeks after planting, two and five weeks after application of treatment with the aid of meter rule and twine, and the following growth and performance parameters; Percentage germination, Number of leaves, Plant spread, Plant height, Seedling vigour, Stem circumference, Leaf length and Leaf width, Number of branches, Trace of disease and Plant performance were collected

Percentage germination was determined by $\frac{\text{number of germinations}}{\text{number of seeds planted}} \times 100$

Seed vigour was determined by $\frac{\text{percentage germination}}{\text{seedlings length}}$

Data were subjected to ANOVA and means separated with Turkey Method (P= 0.05) using Minitab version 17 software.

3. Results and Discussion

This study shows that for species effect, there were variations in number of germination (3WAP), percentage germination (3WAP), and plant height (3WAP), number of leaves (3WAP), seedling vigor (3WAP) and plant spread (3WAP) as shown in Table 1 which was statistically significant. This is in tandem to the findings of several authors [9, 17 and 15] who reported significant difference for varieties of eggplant traits measured. On species performance, *Solanum macrocarpon* outclass others species on application of treatments, this was evidence on Stem circumference, Number of leaves, Leaf length and width, Number of branches and Plant spread at week 5, but significant lower for trace of disease as compare to *Solanum melongena* and *Solanum anguivi* (Table 2). *Solanum anguivi* shown significant different for the Number of germination, percentage germination, seedling vigor and Plant spread which was higher as compare to other species. Table 4 revealed no significant difference were detected among the species for both the organic manure and fertilizer for the Stem circumference, Number

of leaves, Plant spread and Trace of disease, 5 weeks after treatment. Variation in the Number of leaves (5WAMA) showed that species 3 and 2 produced a number of leaves (8.18 and 8.17) better than the number of leaves for species 1 (7.85) which were not significantly different (Table 3). Yuliana *et al.* [17] described that more leaves will increase the photosynthesis process and produce more photosynthesis and of course, it will increase plant growth as well. The increased in Numbers of leaves from 3WAP to 5 WAMA as show in Table 4 shows that the interaction between species of eggplant and organic manure significantly influenced plant growth. This shows that, Plant spread and Number of leaves is also influenced by species type and organic manure. A positive interaction of species and manure type influenced number of branches at 5WAMA by producing the eggplants with many branches as they matured. This is probably because of the present of nitrogen in organic manure.

The effect of manure types on growth of eggplant influenced the Plant height (2WAMA) and Plant height (5WAMA) as shown in Table 3 and Leaf length (5WAMA), Number of branches (5WAMA) and Plant performance (5WAMA) (Table 4) were significantly different as compare to inorganic fertilizer and the control. No significant difference were observed among the manure types, inorganic fertilizer and the control on the Stem circumference (5WAMA), Number of leaves (5WAMA), Plant spread (5WAMA) and Trace of disease (5WAMA) (Table 4)

The effect of manure type on plant height 2WAMA showed that the application of *T. catappa* at 150g (6.39cm), *M. oleifera* at 300g (5.51cm), *T. catappa*+*T. mentalis* at 300g (5.61cm), *T. catappa*+*M. oleifera* at 150g and *T. catappa*+*T. mentalis*+*Moringa oleifera* at 150g was significantly different compared to plant height 3WAP. Taller eggplant were produced at *T. catappa* at 150g (16.50cm), *T. mentalis* at 300g (16.97cm), *T. catappa*+*T. mentalis* at 150/300g (16.78cm and 16.69cm), *T. catappa*+*M. oleifera* at 300g (16.47cm), *T. mentalis*+*M. oleifera* at 300g (16.83cm), *T. catappa*+*T. mentalis*+*M. oleifera* at 300g (16.56cm). According to Taguiling [14] increased in plant heights were as a result of compost of decayed leaves used rich in nutrients. The green biomass-enriched compost with good amount of plant nutrients has promoted plant growth of pepper in terms of height. This also shows that nutrients especially Nitrogen are key factors in plant growth, this result agrees with Moraditochae *et al.* [11] whom opined that release of nitrogen from organic manure increases the length of plants.

Table 1. Analysis of Variance for the Effect of Organic and Inorganic Manure on Growth Parameters of three Eggplant Species.

SOV	Df	Number of germinations3WAP	Percentage germinations3WAP	Plant height3WAP	Number of leaves3WAP
Rep	1	0.5926 ^{ns}	658.1 ^{ns}	0.1302 ^{ns}	0.03704 ^{ns}
Species	2	26.7037**	29694.2**	12.7193**	4.26003**
Manure	17	0.2593 ^{ns}	288.4 ^{ns}	0.1156 ^{ns}	0.10349 ^{ns}
Species×Manure	34	0.2919**	324.5**	0.1359 ^{ns}	0.16009 ^{ns}
Error	53	0.1586	176.4	0.2409	0.15758
Total	107				

Table 1. Continued.

SOV	Df	Seedling vigour3WAP	Plantspread3WAP	Plantheight2WAMA	Plantheight5WAMA
Rep	1	303.3 ^{ns}	0.9728 ^{ns}	8.708**	0.083 ^{ns}
Species	2	1309.3**	23.7517**	30.865**	107.699**
Manure	17	134.5 ^{ns}	0.4680 ^{ns}	2.055**	0.569 ^{ns}
Species×Manure	34	122.2 ^{ns}	0.5271 ^{ns}	1.082**	0.377 ^{ns}
Error	53	134.2	0.7560	1.043	0.711
Total	107				

** = Significant difference @ P<0.05 according to Turkey method, ns= not significant different

Legend: WAP, Weeks after planting, WAMA, Weeks after Manure application.

Table 2. Mean performance of species.

Species	Number of germination 3WAP	Percentage germination 3WAP	Plant height 3WAP	Number of leaves3WAP	Seedling vigour 3WAP	Plant spread 3WAP	Plant height 2WAMA	Plant height 5WAMA
1	2.61 ^B	87.04 ^B	2.56 ^A	3.58 ^A	35.42 ^B	4.87 ^A	6.11 ^A	17.85 ^A
2	2.88 ^A	96.30 ^A	2.26 ^B	3.35 ^B	44.13 ^A	4.92 ^A	4.85 ^B	16.92 ^B
3	1.28 ^C	42.58 ^C	1.42 ^C	2.90 ^C	32.55 ^B	3.49 ^B	4.31 ^B	14.50 ^C

Table 2. Continued.

Species	Stem circumference 5WAMA	Number of leaves 5WAMA	Leaf length 5WAMA	Leaf width5WAMA	Number of branches 5WAMA	Plant spread 5WAMA	Trace of disease 5WAMA	Plant performance 5WAMA
1	1.53 ^B	7.85 ^A	14.32 ^B	8.46 ^C	1.00 ^B	27.62 ^B	0.47 ^A	2.00 ^A
2	1.57 ^B	8.17 ^A	13.04 ^C	9.63 ^B	1.00 ^B	27.21 ^B	0.37 ^A	2.00 ^A
3	2.15 ^A	8.18 ^A	16.46 ^A	13.17 ^A	1.18 ^A	32.50 ^A	0.03 ^B	1.24 ^B

Legend: Means that do not share the same letter are significantly different according to Tukey method (p<0.05). 1= *Solanum melongena*, 2=*Solanum anguivi* and 3= *Solanum macrocarpon*

Table 3. Mean separation for the effect of species×manure type on growth parameters.

Species×Treatment type	Number of Germination 3WAP	Percentage Germination 3WAP	Plant Height 3WAP	Number of Leaves 3WAP	Seedling vigour 3WAP	Plant Spread 3WAP	Plant Height 2WAMA	Plant Height 5WAMA
1Tc(150g)	3.00 ^A	100.00 ^A	3.00 ^A	3.67 ^A	33.30 ^A	4.17 ^A	8.17 ^A	18.00 ^{ABC}
1Tc(300g)	3.00 ^A	100.00 ^A	3.00 ^A	3.67 ^A	33.30 ^A	4.17A	7.50 ^{ABC}	17.33 ^{ABCDEF}
1Tm(150g)	2.00 ^{AB}	66.70 ^{AB}	2.63 ^A	3.00 ^A	31.66 ^A	4.00 ^A	4.88 ^{ABCD}	18.00 ^{ABC}
1Tm(300g)	3.00 ^A	100.00 ^A	3.00 ^A	4.00 ^A	33.30 ^A	4.50 ^A	4.83 ^{ABCD}	18.17 ^{ABCD}
1Mo(150g)	3.00 ^A	100.00 ^A	2.50 ^A	3.17 ^A	41.65 ^A	4.00 ^A	6.50 ^{ABCD}	17.83 ^{AB}
1Mo(300g)	2.50 ^{AB}	83.35 ^{AB}	2.50 ^A	3.50 ^A	33.33 ^A	4.33 ^A	6.13 ^{ABCD}	17.92 ^{ABC}
1Tc+Tm(150g)	2.50 ^{AB}	83.35 ^{AB}	2.75 ^A	3.00 ^A	30.55 ^A	4.67 ^A	5.50 ^{ABCD}	18.33 ^{AB}
1Tc+Tm(300g)	3.00 ^{AB}	100.00 ^A	2.08 ^A	3.83 ^A	48.33 ^A	5.00 ^A	7.00 ^{ABCD}	17.92 ^{ABC}
1Tc+Mo(150g)	3.00 ^A	100.00 ^A	2.67 ^A	3.67 ^A	38.32 ^A	4.83 ^A	7.00 ^{ABCD}	17.50 ^{ABCDE}
1Tc+Mo(300g)	3.00 ^A	100.00 ^A	2.50 ^A	3.83 ^A	41.65 ^A	5.58 ^A	6.08 ^{ABCD}	18.67 ^A
1Tm+Mo(150g)	2.50 ^{AB}	83.35 ^{AB}	2.50 ^A	3.67 ^A	36.12 ^A	5.00 ^A	5.50 ^{ABCD}	17.33 ^{ABCDEF}
1Tm+Mo(300g)	3.00 ^A	100.00 ^A	2.50 ^A	4.00 ^A	41.65 ^A	5.00 ^A	5.67 ^{ABCD}	17.67 ^{ABCD}
1Tc+Tm+Mo(150g)	2.50 ^{AB}	83.35 ^{AB}	2.50 ^A	3.50 ^A	33.33 ^A	5.50 ^A	8.00 ^{AB}	17.50 ^{ABCDE}
1Tc+Tm+Mo(300g)	2.50 ^{AB}	83.35 ^{AB}	2.50 ^A	3.50 ^A	36.12 ^A	4.96 ^A	5.58 ^{ABCD}	18.08 ^{ABC}
1NPK(1.40g)	1.50 ^{AB}	50.00 ^{AB}	2.00 ^A	3.75 ^A	25.00 ^A	5.63 ^A	5.00 ^{ABCD}	18.00 ^{ABC}
1NPK(2.50g)	1.50 ^{AB}	50.00 ^{AB}	2.50 ^A	3.50 ^A	22.23 ^A	6.00 ^A	5.00 ^{ABCD}	17.25 ^{ABCDEF}
1CLT1	3.00 ^A	100.00 ^A	2.50 ^A	3.17 ^A	41.65 ^A	5.00 ^A	5.83 ^{ABCD}	18.17 ^{AB}
1CLT2	2.50 ^{AB}	83.35 ^{AB}	2.50 ^A	4.00 ^A	36.12 ^A	5.29 ^A	5.83 ^{ABCD}	17.67 ^{ABCD}
2Tc(150g)	2.50 ^{AB}	83.35 ^{AB}	2.00 ^A	3.50 ^A	41.68 ^A	5.17 ^A	5.50 ^{ABCD}	16.75 ^{ABCDEF}
2Tc(300g)	2.50 ^{AB}	83.35 ^{AB}	2.00 ^A	3.17 ^A	41.68 ^A	5.33 ^A	4.75 ^{ABCD}	16.75 ^{ABCDEF}
2Tm(150g)	3.00 ^A	100.00 ^A	1.92 ^A	3.00 ^A	52.78 ^A	5.17 ^A	4.67 ^{ABCD}	16.83 ^{ABCDEF}

Species×Treatment type	Number of Germination 3WAP	Percentage Germination 3WAP	Plant Height 3WAP	Number of Leaves 3WAP	Seedling vigour 3WAP	Plant Spread 3WAP	Plant Height 2WAMA	Plant Height 5WAMA
2Tm(300g)	2.50 ^{AB}	83.35 ^{AB}	2.50 ^A	3.50 ^A	39.12 ^A	5.25 ^A	4.50 ^{ABCD}	16.75 ^{ABCDEF}
2Mo(150g)	3.00 ^A	100.00 ^A	2.00 ^A	3.83 ^A	50.00 ^A	4.50 ^A	5.33 ^{ABCD}	16.83 ^{ABCDEF}
2Mo(300g)	2.50 ^{AB}	83.35 ^{AB}	2.00 ^A	3.50 ^A	44.45 ^A	5.25 ^A	4.42 ^{ABCD}	16.75 ^{ABCDEF}
2Tc+Tm(150g)	3.00 ^A	100.00 ^A	2.67 ^A	4.00 ^A	38.87 ^A	4.83 ^A	4.33 ^{ABCD}	17.00 ^{ABCDEF}
2Tc+Tm(300g)	3.00 ^A	100.00 ^A	2.50 ^A	3.17 ^A	41.65 ^A	4.67 ^A	5.33 ^{ABCD}	17.17 ^{ABCDEF}
2Tc+Mo(150g)	3.00 ^A	100.00 ^A	2.50 ^A	3.50 ^A	41.65 ^A	5.50 ^A	4.83 ^{ABCD}	17.00 ^{ABCDEF}
2Tc+Mo(300g)	3.00 ^A	100.00 ^A	2.17 ^A	3.00 ^A	47.22 ^A	4.33 ^A	4.33 ^{ABCD}	17.00 ^{ABCDEF}
2Tm+Mo(150g)	3.00 ^A	100.00 ^A	2.17 ^A	3.17 ^A	47.22 ^A	4.83 ^A	5.17 ^{ABCD}	17.00 ^{ABCDEF}
2Tm+Mo(300g)	3.00 ^A	100.00 ^A	2.50 ^A	3.00 ^A	41.65 ^A	4.50 ^A	4.83 ^{ABCD}	17.33 ^{ABCDEF}
2Tc+Tm+Mo(150g)	3.00 ^A	100.00 ^A	2.50 ^A	3.17 ^A	41.65 ^A	4.83 ^A	4.50 ^{ABCD}	17.00 ^{ABCDEF}
2Tc+Tm+Mo(300g)	3.00 ^A	100.00 ^A	2.50 ^A	3.33 ^A	41.65 ^A	4.67 ^A	4.00 ^{ABCD}	17.33 ^{ABCDEF}
2NPK(1.40g)	3.00 ^A	100.00 ^A	2.00 ^A	3.50 ^A	50.00 ^A	4.83 ^A	5.50 ^{ABCD}	16.83 ^{ABCDEF}
2NPK(2.50g)	3.00 ^A	100.00 ^A	2.00 ^A	3.17 ^A	50.00 ^A	4.33 ^A	4.67 ^{ABCD}	16.50 ^{ABCDEF}
2CLT1	3.00 ^A	100.00 ^A	2.33 ^A	3.33 ^A	44.43 ^A	5.33 ^A	5.17 ^{ABCD}	17.00 ^{ABCDEF}
2CLT2	3.00 ^A	100.00 ^A	2.50 ^A	3.50 ^A	41.65 ^A	5.17 ^A	5.50 ^{ABCD}	16.67 ^{ABCDEF}
3Tc(150g)	2.00 ^{AB}	66.70 ^{AB}	1.75 ^A	2.75 ^A	38.91 ^A	4.25 ^A	5.50 ^{ABCD}	14.75 ^{BCDEF}
3Tc(300g)	1.00 ^B	33.30 ^B	1.75 ^A	3.00 ^A	19.42 ^A	3.00 ^A	3.00 ^D	14.50 ^{CDEF}
3Tm(150g)	1.50 ^{AB}	50.00 ^{AB}	1.50 ^A	2.75 ^A	33.33 ^A	2.50 ^A	4.00 ^{ABCD}	14.50 ^{CDEF}
3Tm(300g)	1.00 ^B	33.30 ^B	1.25 ^A	3.00 ^A	27.75 ^A	3.00 ^A	3.50 ^{CD}	16.00 ^{ABCDEF}
3Mo(150g)	1.00 ^B	33.30 ^B	1.75 ^A	3.00 ^A	19.43 ^A	3.00 ^A	4.00 ^{ABCD}	14.50 ^{CDEF}
3Mo(300g)	1.50 ^{AB}	50.00 ^{AB}	1.25 ^A	3.00 ^A	41.66 ^A	3.75 ^A	6.00 ^{ABCD}	14.50 ^{CDEF}
3Tc+Tm(150g)	1.00 ^B	33.30 ^B	1.75 ^A	3.00 ^A	19.43 ^A	3.00 ^A	3.00 ^D	15.00 ^{BCDEF}
3Tc+Tm(300g)	1.50 ^{AB}	50.00 ^{AB}	1.50 ^A	3.00 ^A	41.68 ^A	3.50 ^A	4.50 ^{ABCD}	15.00 ^{BCDEF}
3Tc+Mo(150g)	1.00 ^B	33.30 ^B	1.50 ^A	3.00 ^A	24.98 ^A	3.00 ^A	5.50 ^{ABCD}	13.50 ^G
3Tc+Mo(300g)	1.50 ^{AB}	50.00 ^{AB}	1.13 ^A	3.00 ^A	44.44 ^A	4.25 ^A	3.25 ^{CD}	13.75 ^{FG}
3Tm+Mo(150g)	1.00 ^B	33.30 ^B	1.25 ^A	3.00 ^A	27.75 ^A	4.00 ^A	5.00 ^{ABCD}	13.50 ^G
3Tm+Mo(300g)	1.50 ^{AB}	50.00 ^{AB}	1.25 ^A	3.00 ^A	38.89 ^A	3.50 ^A	4.50 ^{ABCD}	15.50 ^{ABCDEF}
3Tc+Tm+Mo(150g)	1.50 ^{AB}	50.00 ^{AB}	1.25 ^A	2.75 ^A	44.44 ^A	3.50 ^A	4.00 ^{ABCD}	14.75 ^{BCDEF}
3Tc+Tm+Mo(300g)	2.00 ^{AB}	66.70 ^{AB}	1.13 ^A	2.50 ^A	61.12 ^A	4.00 ^A	3.75 ^{BCD}	14.25 ^{DEFG}
3NPK(1.40g)	1.00 ^B	33.30 ^B	1.75 ^A	3.00 ^A	19.43 ^A	3.50 ^A	4.00 ^{ABCD}	14.50 ^{CDEF}
3NPK(2.50g)	1.00 ^B	33.30 ^B	1.25 ^A	3.00 ^A	27.75 ^A	3.00 ^A	4.00 ^{ABCD}	13.50 ^G
3CLT1	1.00 ^B	33.30 ^B	1.25 ^A	3.00 ^A	27.75 ^A	4.00 ^A	4.50 ^{ABCD}	14.00 ^{EFG}
3CLT2	1.00 ^B	33.30 ^B	1.25 ^A	2.50 ^A	27.75 ^A	4.00 ^A	5.50 ^{ABCD}	15.00 ^{BCDEF}

Means that do not share a letter are significantly different. Legend: 1= *Solanum melongena*, 2=*Solanum anguivi* and 3= *Solanum macrocarpon*. Tc1@150g = *T. catappa*, Tc2@300g= *T. catappa*, Tm1@150g= *T. mentalis*, Tm2@300g = *T. mentalis*, Mo1@150g= *M. oleifera*, Mo2@300g =*M. oleifera*, Tc+Tm1@150g= *T. catappa* +*T. mentalis*, Tc+Tm2@300g= *T. catappa*+*T. mentalis*, Tc+Mo1@150g= *T. catappa*+*M. oleifera* Tc+Mo2@300g=*T. catappa*+*M. oleifera*, Tm+Mo1@150g= *T. mentalis*+*M. oleifera*, Tm+Mo2@300g= *T. mentalis*+*Moringa oleifera*, Tc+Tm+Mo1@150g= *Terminalia catappa*+*T. mentalis*+*M. oleifera*, Tc+Tm+Mo2@300g= *T. catappa*+*T. mentalis*+*M. oleifera*, NPK1@1.40g= Fertilizer, NPK2@2.50g= Fertilizer, CLT1= Control pot CLT2= Control pot

Table 4. Mean separation for the effect of species×manure type on growth parameters.

Species×treatment type	Stem Circumference 5WAMA	Number of Leaves 5WAMA	Leaf Length 5WAMA	Leaf Width 5WAMA	Number of Branches 5WAMA	Plant Spread 5WAMA	Trace of Disease 5WAMA	Plant Performance 5WAMA
1Tc(150g)	1.55 ^A	7.33 ^A	11.00 ^B	9.00 ^{BCDE}	1.00 ^B	26.67 ^A	0.83 ^A	2.00 ^A
1Tc(300g)	1.40 ^A	7.50 ^A	14.00 ^{AB}	9.00 ^{BCDE}	1.00 ^B	26.83 ^A	1.33 ^A	2.00 ^A
1Tm(150g)	1.50 ^A	9.00 ^A	14.00 ^{AB}	9.00 ^{BCDE}	1.00 ^B	28.00 ^A	0.50 ^A	2.00 ^A
1Tm(300g)	1.62 ^A	7.83 ^A	14.00 ^{AB}	8.00 ^{DE}	1.00 ^B	30.50 ^A	0.50 ^A	2.00 ^A
1Mo(150g)	1.47 ^A	7.50 ^A	15.00 ^{AB}	8.00 ^{DE}	1.00 ^B	28.83 ^A	0.50 ^A	2.00 ^A
1Mo(300g)	1.50 ^A	7.92 ^A	14.75 ^{AB}	8.75 ^{CDE}	1.00 ^B	26.25 ^A	0.50 ^A	2.00 ^A
1Tc+Tm(150g)	1.70 ^A	8.08 ^A	15.00 ^{AB}	9.00 ^{BCDE}	1.00 ^B	30.33 ^A	-0.00 ^A	2.00 ^A
1Tc+Tm(300g)	1.51 ^A	7.92 ^A	14.83 ^{AB}	8.08 ^{DE}	1.00 ^B	25.17 ^A	1.00 ^A	2.00 ^A
1Tc+Mo(150g)	1.42 ^A	7.83 ^A	14.00 ^{AB}	8.83 ^{CDE}	1.00 ^B	28.00 ^A	0.50 ^A	2.00 ^A
1Tc+Mo(300g)	1.93 ^A	7.67 ^A	14.00 ^{AB}	7.83 ^E	1.00 ^B	28.58 ^A	0.50 ^A	2.00 ^A
1Tm+Mo(150g)	1.36 ^A	8.08 ^A	14.33 ^{AB}	8.17 ^{DE}	1.00 ^B	28.25 ^A	0.00 ^A	2.00 ^A
1Tm+Mo(300g)	1.43 ^A	7.50 ^A	15.00 ^{AB}	8.17 ^{DE}	1.00 ^B	25.50 ^A	0.33 ^A	2.00 ^A
1Tc+Tm+Mo(150g)	1.28 ^A	6.75 ^A	14.75 ^{AB}	8.00 ^{DE}	1.00 ^B	31.50 ^A	0.50 ^A	2.00 ^A
1Tc+Tm+Mo(300g)	1.47 ^A	8.33 ^A	15.25 ^{AB}	8.50 ^{CDE}	1.00 ^B	26.08 ^A	-0.00 ^A	2.00 ^A
1NPK(1.40g)	1.50 ^A	8.00 ^A	14.00 ^{AB}	8.00 ^{DE}	1.00 ^B	30.00 ^A	0.50 ^A	2.00 ^A
1NPK(2.50g)	1.43 ^A	9.00 ^A	15.00 ^{AB}	9.00 ^{BCDE}	1.00 ^B	24.50 ^A	1.00 ^A	2.00 ^A
1CLT1	1.77 ^A	7.83 ^A	14.00 ^{AB}	9.00 ^{BCDE}	1.00 ^B	27.33 ^A	0.00 ^A	2.00 ^A
1CLT2	1.69 ^A	7.17 ^A	14.83 ^{AB}	8.00 ^{DE}	1.00 ^B	24.83 ^A	0.00 ^A	2.00 ^A

Species×treatment type	Stem Circumference 5WAMA	Number of Leaves 5WAMA	Leaf Length 5WAMA	Leaf Width 5WAMA	Number of Branches 5WAMA	Plant Spread 5WAMA	Trace of Disease 5WAMA	Plant Performance 5WAMA
2Tc(150g)	1.43 ^A	8.00 ^A	13.50 ^{AB}	10.50 ^{ABCDE}	1.00 ^B	29.75 ^A	-0.00 ^A	2.00 ^A
2Tc(300g)	1.48 ^A	7.75 ^A	13.25 ^{AB}	10.50 ^{ABCDE}	1.00 ^B	27.25 ^A	-0.00 ^A	2.00 ^A
2Tm(150g)	1.43 ^A	8.33 ^A	12.50 ^{AB}	9.67 ^{BCDE}	1.00 ^B	25.67 ^A	-0.00 ^A	2.00 ^A
2Tm(300g)	1.45 ^A	7.75 ^A	12.75 ^{AB}	9.75 ^{BCDE}	1.00 ^B	26.50 ^A	-0.00 ^A	2.00 ^A
2Mo(150g)	1.50 ^A	8.83 ^A	12.83 ^{AB}	9.50 ^{BCDE}	1.00 ^B	28.83 ^A	1.50 ^A	2.00 ^A
2Mo(300g)	1.85 ^A	8.25 ^A	13.25 ^{AB}	10.00 ^{BCDE}	1.00 ^B	27.25 ^A	1.00 ^A	2.00 ^A
2Tc+Tm(150g)	1.65 ^A	8.67 ^A	13.00 ^{AB}	10.00 ^{BCDE}	1.00 ^B	27.33 ^A	-0.00 ^A	2.00 ^A
2Tc+Tm(300g)	1.68 ^A	8.17 ^A	12.50 ^{AB}	8.83 ^{CDE}	1.00 ^B	25.83 ^A	-0.00 ^A	2.00 ^A
2Tc+Mo(150g)	1.45 ^A	7.50 ^A	13.33 ^{AB}	10.17 ^{BCDE}	1.00 ^B	30.17 ^A	1.00 ^A	2.00 ^A
2Tc+Mo(300g)	1.58 ^A	7.83 ^A	12.67 ^{AB}	9.50 ^{BCDE}	1.00 ^B	29.33 ^A	-0.00 ^A	2.00 ^A
2Tm+Mo(150g)	1.53 ^A	8.33 ^A	13.00 ^{AB}	9.33 ^{BCDE}	1.00 ^B	29.67 ^A	1.00 ^A	2.00 ^A
2Tm+Mo(300g)	1.52 ^A	8.50 ^A	13.50 ^{AB}	9.50 ^{BCDE}	1.00 ^B	28.67 ^A	0.17 ^A	2.00 ^A
2Tc+Tm+Mo(150g)	1.55 ^A	7.50 ^A	12.83 ^{AB}	9.00 ^{BCDE}	1.00 ^B	26.50 ^A	0.17 ^A	2.00 ^A
2Tc+Tm+Mo(300g)	1.67 ^A	8.17 ^A	12.58 ^{AB}	9.33 ^{BCDE}	1.00 ^B	22.08 ^A	0.17 ^A	2.00 ^A
2NPK(1.40g)	1.65 ^A	8.50 ^A	13.67 ^{AB}	10.17 ^{BCDE}	1.00 ^B	26.17 ^A	-0.00 ^A	2.00 ^A
2NPK(2.50g)	1.70 ^A	8.83 ^A	13.00 ^{AB}	9.50 ^{BCDE}	1.00 ^B	27.17 ^A	-0.00 ^A	2.00 ^A
2CLT1	1.78 ^A	8.33 ^A	13.33 ^{AB}	9.67 ^{BCDE}	1.00 ^B	26.33 ^A	0.83 ^A	2.00 ^A
2CLT2	1.47 ^A	7.83 ^A	13.17 ^{AB}	8.50 ^{CDE}	1.00 ^B	25.33 ^A	0.83 ^A	2.00 ^A
3Tc(150g)	2.20 ^A	8.25 ^A	16.00 ^{AB}	12.00 ^{ABCDE}	1.25 ^{AB}	33.25 ^A	0.00 ^A	1.25 ^{AB}
3Tc(300g)	2.20 ^A	7.50 ^A	16.50 ^{AB}	13.50 ^{ABCDE}	1.00 ^B	36.50 ^A	0.00 ^A	1.50 ^{AB}
3Tm(150g)	2.15 ^A	8.00 ^A	18.00 ^A	16.00 ^A	1.00 ^B	28.25 ^A	0.25 ^A	1.00 ^B
3Tm(300g)	2.25 ^A	8.50 ^A	16.00 ^{AB}	12.00 ^{ABCDE}	1.00 ^B	24.00 ^A	0.00 ^A	2.00 ^A
3Mo(150g)	2.30 ^A	8.00 ^A	16.00 ^{AB}	12.00 ^{ABCDE}	1.00 ^B	34.50 ^A	-0.00 ^A	1.00 ^B
3Mo(300g)	2.40 ^A	8.75 ^A	17.25 ^{AB}	14.75 ^{AB}	1.50 ^{AB}	33.75 ^A	0.00 ^A	1.00 ^B
3Tc+Tm(150g)	2.20 ^A	8.50 ^A	16.00 ^{AB}	12.00 ^{ABCDE}	1.50 ^{AB}	34.00 ^A	-0.00 ^A	1.50 ^{AB}
3Tc+Tm(300g)	2.53 ^A	9.00 ^A	17.00 ^{AB}	14.00 ^{ABC}	1.50 ^{AB}	35.50 ^A	0.00 ^A	1.25 ^{AB}
3Tc+Mo(150g)	2.15 ^A	7.50 ^A	16.00 ^{AB}	12.00 ^{ABCDE}	1.50 ^{AB}	35.00 ^A	-0.00 ^A	1.00 ^B
3Tc+Mo(300g)	2.05 ^A	8.50 ^A	16.50 ^{AB}	13.00 ^{ABCDE}	1.00 ^B	34.00 ^A	-0.00 ^A	1.25 ^{AB}
3Tm+Mo(150g)	2.00 ^A	8.50 ^A	16.50 ^{AB}	13.50 ^{ABCDE}	1.00 ^B	35.00 ^A	-0.00 ^A	1.00 ^B
3Tm+Mo(300g)	2.50 ^A	9.00 ^A	16.75 ^{AB}	13.75 ^{ABCD}	1.00 ^B	33.00 ^A	0.00 ^A	1.50 ^{AB}
3Tc+Tm+Mo(150g)	2.20 ^A	8.00 ^A	18.00 ^{AB}	16.00 ^A	1.00 ^B	32.25 ^A	-0.00 ^A	1.00 ^B
3Tc+Tm+Mo(300g)	1.75 ^A	8.25 ^A	14.75 ^{AB}	11.50 ^{ABCDE}	1.00 ^B	31.50 ^A	0.25 ^A	1.50 ^{AB}
3NPK(1.40g)	1.90 ^A	8.00 ^A	15.50 ^{AB}	11.50 ^{ABCDE}	1.00 ^B	28.00 ^A	-0.00 ^A	1.00 ^B
3NPK(2.50g)	1.85 ^A	7.00 ^A	16.50 ^{AB}	13.50 ^{ABCDE}	1.00 ^B	35.50 ^A	-0.00 ^A	1.00 ^B
3CLT1	1.75 ^A	8.50 ^A	17.00 ^{AB}	14.00 ^{ABC}	2.00 ^A	30.50 ^A	-0.00 ^A	1.00 ^B
3CLT2	2.35 ^A	7.50 ^A	16.00 ^{AB}	12.00 ^{ABCDE}	1.00 ^B	32.50 ^A	-0.00 ^A	1.50 ^{AB}

Means that do not share a letter are significantly different. Legend: Tc1@150g = *T. catappa*, Tc2@300g = *T. catappa*, Tm1@150g = *T. mentalis*, Tm2@300g = *T. mentalis*, Mo1@150g = *M. oleifera*, Mo2@300g = *M. oleifera*, Tc+Tm1@150g = *T. catappa* + *T. mentalis*, Tc+Tm2@300g = *T. catappa* + *T. mentalis*, Tc+Mo1@150g = *T. catappa* + *M. oleifera*, Tc+Mo2@300g = *T. catappa* + *M. oleifera*, Tm+Mo1@150g = *T. mentalis* + *M. oleifera*, Tm+Mo2@300g = *T. mentalis* + *M. oleifera*, Tc+Tm+Mo1@150g = *T. catappa* + *T. mentalis* + *M. oleifera*, Tc+Tm+Mo2@300g = *T. catappa* + *T. mentalis* + *M. oleifera*, NPK1@1.40g = Fertilizer, NPK2@2.50g = Fertilizer, CLT1 = Control pot CLT2 = Control pot

4. Conclusion

The findings of this study shows that various combinations of different organic manure types is a determinant factor in accessing the variable response to growth of selected species of eggplant (*Solanum melongena* L., *Solanum anguivi* L., *Solanum macrocarpon* L.). On species performance, *Solanum macrocarpon* outclass others species on application of treatments, The effect of manure types on growth of eggplant influenced the Plant height (2WAMA), Plant height (5WAMA), Leaf length (5WAMA), Number of branches (5WAMA) and Plant performance (5WAMA) were significantly different as compare to inorganic fertilizer and the control. The interaction of varieties x manure type was found to only produce significant effect in plant height, leaf

length, leaf width, number of branches, plant spread and plant performance in eggplants. This showed that organic manure increases vegetative growth of eggplant that will resulted to high yield which is safe for consumption and cheap for our peasant farmers to obtain.

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