Evaluation of Vegetative Estalishment of African Egg Plant (*Solanum Macrocarpon*. Linn) Enhanced With Fertilizer Application

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Abstract: **This study is based on the use of organic and inorganic fertilizer application in raising *Solanum macrocapon* stem cuttings. The study was conducted in the Green House of the Federal College of Forestry, Ibadan. The experiment considered the use of poultry manure and NPK 15:15:15 as treatments in growing *Solanum macrocapon* stem cuttings. There were nine (9) treatment which consisted of 7.5g, l0g, 12.5g, 15g of poultry manure and 0.75g. l.0g, l.25g and l.5g of NPK (15:15:15), each were added to 2kg of top soil while 2kg topsoil only served as control. The treatments were assigned in completely Randomized Design (CRD) with five (5) replicates. The parameters assessed includes the emergence of leaf, leaf production, leaf area, harvest yield and dry matter content, all which were subjected to Analysis of Variance and the means were separated using the Duncan Multiple Range Test. The results showed that treatment application of l.25g of NPK 15:15:15 had the highest mean value for leaf production, leaf area, and dry weight of first and second harvest, fresh weight of first and second harvest, while control has the least mean value for all the test carried out. 7.5g of poultry manure and control have the least mean value in leaf area. The results showed that treatment application of 15g of poultry manure had the highest mean value for days to first flower. There is no significant differences in the emergence of leaf. Based on the results of this study, application of NPK 15:15:15 at l2.5g per 2kg of soil is recommended for yield production of *Solanum macrocarpon* stem cuttings.**

I. INTRODUCTION

Leafy vegetables are important items of the diet in many Nigerian homes and they are valuable sources of nutrients especially in rural areas where they contribute substantially to protein, minerals, vitamins, fiber and other nutrients which are usually in short supply in the daily diets (Mosha and Gaga, 2000). They have the cheapest and most abundant sources of protein and add flavor, taste, color and aesthetic appeal to the diet (Mepha *et al.,* 2007). Consumption of vegetable ensures the intake of various essential vitamins and minerals elements thus avoiding the problem of malnutrition (Yamaguchi 2005). *Solanum macrocarpon* is one of the traditional vegetables in Nigeria. It has a large cultivar variety and grows in areas of high rainfall found in the tropical and humid regions of West and Central Africa, South-East Asia, South America and the Caribbean. It is commonly known for its medicinal and nutritional properties used in preparing soups and stews. (Adeyeye and Adanlawo, 2011). The leaves are rich in protein, fat, crude fibre, calcium and zinc and are found to contain appreciable amounts of the amino acid, methionine. The leaves have a variety of medicinal uses. For example, in Sierra Leone boiled leaves are chewed to treat throat problems; in Kenya the crushed leaves are taken to treat stomach problems. It is also used to treat toothaches and cardiac diseases (Bello and Muhammad, 2005).

In Southern Nigeria, *Solanum macrocarpon* known as "Igbagba" is one of the most important vegetable use in indigenous medicine ranges from weight reduction to treatment of several ailments including asthma, allergic rhinitis, nasal catarrh, skin infections, rheumatic disease and swollen joint pains, gastro-esophageal reflux disease, constipation and dyspepsia. (Nwodo *et al.,* 2011). Both the leave and the fruit of *Solanum macrocarpon* are considerably high in calcium, iron, potassium, magnesium, vitamin A,C,E, folic acid, potassium, riboflavin, that contribute to growth and the maintenance of good health. (Ojo and Olufolaji, 2000; Fasuyi, 2006). *Solanum macrocarpon* is propagated by seed and stem cutting. The cutting of apical meristem prior to onset of flowering is a common agronomic practice that could increase yield, provide seed growers additional income from the sale of leafy vegetables and can delay or extend seed harvest against period of surplus for maximum profit (Ojo *et al*, 2001). This study investigated the vegetative establishment of *Solanum macrocarpon* enhanced with both organic fertilizer and inorganic fertilizer.

II. MATERIALS AND METHODS

The experiment was carried out in Green house of Federal College of Forestry, Jericho Ibadan, Ibadan North West Local Government Area of Oyo state (Latitude 7 23N and Longitude 3 36E). The experimental site has the following properties: annual rainfall, 1400mm-1500mm; average relative humidity, 65%; average temperature, 32^{o}C; two distinct seasons, dry and rainy season- dry season commences from November to March and rainy season from April to October (FRIN meteorological report, 2014). Two kilograms (2kg) of top soil was collected into each of the forty five (45) polythene pots used for the study. *Solanum macrocarpon* vegetable was purchased from National Horticultural Research Institute (NIHORT) Ibadan, Oyo State. The leaves on the stems were

detached and the stem were then cut into 6cm length with at least 2 nodes. Each stem cutting of *Solanum macrocarpon* was planted into each black polythene pot.

The organic fertilizer (poultry manure) was collected from the Federal College of Forestry poultry farm and it was air-dried for two weeks before it was applied to the soil. Poultry manure was applied to the soil at the rate of 7.5g, 10g, 12.5g, and 15g respectively. The polythene pots into which poultry manure was added was watered for two weeks before planting to allow decomposition of the manure. N.P.K fertilizer was purchased from Jubaili Jericho, Ibadan Oyo State. N.P.K (15:15:15) fertilizer was apply three weeks after planting at rates 0.75g, 1.0g, 1.25g, 1.5g respectively. Both organic and inorganic fertilizers were applied based on literature. The stem cuttings were planted and necessary cultural practice was carried out such as watering, weeding. The experiment Design was 2x4x5 factorial with control. The experiment was laid out in Complete Randomized Design (CRD) a total of 45units. The following parameters were assessed at two weeks interval; days to first emergence of leaves, leaf production: (Number of leave per plant was counted), leaf Area (leaf length and leaf width will be measured using graph paper method), days to first flower, harvest weigh (the fresh leaf was weighed after harvest) and dry leaf matter content.

All data collected was subjected to analysis of variance (ANOVA) and where significant the mean was separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

III. RESULT AND DISCUSSIONS

3.1 Chemical properties of top soil and poultry manure used

Table 1 and 2 revealed the laboratory analysis result of topsoil and poultry manure used in the experiment. However, the result showed that poultry manure is rich in organic matter, which had been the major supplier of the soil major nutrients (i.e nitrogen, phosphorus and potassium) required by plants for their normal growth and development. Furthermore, the richness of this organic matter in poultry manure had greatly impacted and influenced plants metabolic activities, e.g provision of readily available and sustainable essential mineral nutrients, improved soil aeration, increased nutrient absorption by plant root, improve soil water holding capacity, etc. it's exchangeable salt content which includes sodium, potassium and calcium has provided the plants with necessary salt needed for their normal functioning. Furthermore, the result also showed that poultry manure has pH value of 6, which is at a favorable range required for normal functioning of the nitrogen fixing bacteria and nitrobacteria present in the soil. Therefore, poultry manure would be able to provide the soil with necessary mineral nutrients needed for the seedlings normal growth and development.

Table 1: Chemical properties of topsoil

ID	pH in H_2O	T.O.C	T. N	P	Ca	Mg	Na	K
Topsoil	6	25.6	2.65	7.75	3.51	0.57	2.22	0.09

Table 2: Chemical properties of poultry manure

Properties	pH in H_2O	T.O.M(%)	T. N (%)	Ca (%)	Mg (%)	Na (%)	K (%)
Poultry Manure	7.6	59.6	6.17	1.92	0.036	0.31	0.341

3.2 Effect of different sources of fertilizer and application rate on the leaf production of African eggplant

Effects of different sources of fertilizer and application rate on the leaf production of African eggplant from week 2 to week 12 is shown on Table 3. The result revealed that there is significant effect of the treatment on the leaf production in the African eggplant. There is significant effect of the fertilizer sources and application rate in all the weeks assessed with BT3 (1.25g of NPK 15:15:15+ Topsoil) having the highest leaf production mean of 38.80cm at week 12 followed by BT2 (1g of NPK 15:15:15+ Topsoil) with the value of 22.80cm, then AT3 (12.5g of poultry manure+ Top soil), with a value of 21.40cm. This work agree with Olaniyi and Ojetayo, (2010) who reported that application of fertilizer gave vigorous development in leaf production due to the release of considerable amount of nutrients for plant use, which is essential for the formation of plant essential molecules such as chlorophyll and protoplasm. Topsoil (No manure) which was the control have the least performance with the value of 5.60. BT3 (1.25g of NPK 15:15:15+ Top soil) have the highest leaf production and the result is significantly different from all other treatments and all the treatment have a higher significant mean when compared to the control at week 12.

3.3 Effect of different sources of fertilizer and application rate on the leaf area of African eggplant

Table 4 shows the effect of different sources of fertilizer and varying application rate on the leaf area of African eggplant from week 2 to week 12. There was significant effect of the sources of fertilizer in all the weeks except at week 1, while there was also significant effect of the application rate at weeks 8, 10 and 12. The application of BT3 (1.25g NPK 15:15:15+Top soil) had the highest mean at week 12 while the least mean was recorded in the control (Top soil) and the result of control was not significantly different from the application of ATI (7.5g Poultry manure+Top soil). The result was in conformity with the work of Akanbi *et al.* (2007) which shows that leaf area of telfairia occidentals were improved with adequate fertilizer application and were better in plants that received 100%NPK 15:15:15 fertilizer.

3.4 Dry weigh of first harvest and dry weight of second harvest

The result obtained in the dry weight of first and second harvest showed there is significant effect in the application of fertilizer. The application of BT3 (1.25g NPK 15:15:15+Topsoil) had the highest mean dry weight in first and second harvest of 2.072g and 10.360g respectively and they are significantly different from all other treatments. The result was similar to the one reported by Olatunji and Ayuba (2011) that application of NPK fertilizer produced higher yield of maize. The least mean dry weight in first and second harvest was recorded in the control treatment having 0.050g and 0.968g respectively. In the second harvest the application of ATI (7.5g Poultry manure+2kg Topsoil) is not significantly different from the control application.

3.5Fresh weigh of first harvest and fresh weight of second harvest

There is significant effect of the application of fertilizer on the fresh harvest weight in first and second harvest. The least mean weight of fresh harvest was recorded in AT4 (15g Poultry manure+2kg Topsoil) in first harvest of 0.552g and control in second harvest of 2.600g and they are both significantly different from all other treatments. The highest mean weight was recorded in BT3 (1.25g NPK 15:15:15+Topsoil) in both first and second harvest having 4.850g and 23.400g respectively.

Days to first flower and Mean of leaf emergence

There is significant effect of the fertilizer on the days to first flower recorded in the crop as the all the treatments of fertilizer have a significant difference in days to first flower when compared to the control. The application of BT3 (1.25g NPK 15:15:15+2kg Topsoil) have the earliest days to first flower of 46.80days and is not significantly different from the application AT4 (15g Poultry manure+2kg Topsoil) of 55.20days. There is no significant difference in the leaf emergence for all the treatment as shown on Table 4.

Table 5: Mean of days to first flower leaf emergence, first and second, total fresh and dry harvest weight

RENT TYPE		DFF		FWFH		DWFH		DWFH		DWSH	LE
A	T1	74,40	C	1.800	E	0.752	D	3.200	E	8..360ef	9.00a
	T2	60.20	B	2.040	C	0.149	F	6.320	C	1.640 e	7.00a
	T3	56.80	B	1.756	F	0.752	D	3.740	E	2.280 d	7.20a
	T4	55.20	Ab	0.552	H	0.025	H	5.440	D	3.820 c	8.00a
B	T1	58.20	B	2.020	C	0.636	E	3.200	e	1.660 e	7.20a
	T2	57.40	B	1.972	D	0.856	C	5.110	d	2.162 d	7.20a
	T3	46.80	A	4.850	A	2.072	A	23.400	a	10.360a	7.00a
	T4	59.20	B	3.000	B	1.276	B	8.600	b	5.000 b	8.80a
CONTROL	T0	124.60	D	0.750	G	0.050	G	2.600	f	0.968 f	7.20a
LSD 5%		9.53		0.044		0.009		0.533		0.452	2.53

Means followed by the same letter (s) within a treatment column are not statistically significant at 5% level of probability

*= Significant

NS= Not significant

DFF= Days to first flower

FWFH= Fresh weigh of first harvest

DWFH= Dry weigh of first harvest

FWSH= Fresh weigh of second harvest

LF= Leaf emergence

DWSH= Dry weigh of second harvest

IV. CONCLUSION

It was observed that *solanum macrocarpon* stem cutting performed best in BT3 (1.25g of NPK 15:15:15+2kg Top soil) more than other manures with respect to leaves production and leaf area. BT3 (1.25g of NPK 15:15:15+2kg Topsoil) have highest mean in first harvest and second harvest, it also have the earliest days to first flower. AT4 (15g of Poultry manure+2kg Top soil) have least weight of harvest. Therefore, there is an improvement in the growth of the plant which eventually influence the productivity of *Solanum macrocarpon* stem cutting. It can also be concluded from the study that NPK is more effective than poultry manure. It is therefore recommended that *Solanum macrocarpon* stem

cutting should be planted with the rate of (1.25g of NPK 15:15:15+Topsoil) since it had the best performance in terms of leaf production and leaf area and it is believe that the higher the number of leaves the higher the rate of photosynthesis in the plant, hence the greater the yield.

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Table 3: Effects of different sources of fertilizer and application rate on the leaf production of African eggplant

FERT	TRT	WK2	WK4	WK6	WK8	WK10	WK12
A	T1	3.80 d	7.00 cd	9.80 cd	11.20 cd	13.60cde	15.20 de
A	T2	5.00 cd	5.20 d	7.00 d	7.60 de	11.80 de	12.25 e
A	T3	5.80 bc	8.20 bc	11.00 bc	14.20 bc	18.80 b	21.40 bc
A	T4	3.40 de	6.20 cd	8.80 cd	7.60 de	9.60 e	12.60 e
B	T1	4.20 cd	7.20 cd	10.60 c	12.40 c	15.60bed	18.20 cd
B	T2	7.00 b	10.40 b	13.80 b	18.00 ab	20.00 b	22.80 b
B	T3	8.80 a	13.40 a	17.20 a	22.40 a	34.00 a	38.80 a
B	T4	3.40 de	6.80 cd	10.00 c	13.20 c	17.00 bc	19.60 bc
CONTROL	T0	2.00 e	2.60 e	3.40 e	3.60 e	4.00 f	5.60 f
	LSD5%	1.65	2.49	2.90	4.73	5.01	3.37
Interaction	FERT	*	*	*	*	*	*
	TRT	*	*	*	*	*	*
	FERT X	NS	*	*	NS	*	*
	TRT						

Means followed by the same letters (S) within a treatment column are not statistically significant at 5% level of probability

*= Significant

NS= Not significant

Table 4: Effect of different sources of fertilizer and application rate on the leaf area of African eggplant

FERT	TRT	WK2	WK4	WK6	WK8	WK10	WK12
A	T1	2.96 b	11.90 cd	14.44 e	17.61 de	28.16 ef	30.92 ef
A	T2	9.76 b	19.88 bed	29.10 de	31.92 de	40.60 ef	53.68 e
A	T3	5.54 b	20.13 bed	36.27 cde	58.18 cd	82.39 cd	99.66 cd
A	T4	9.62 b	30.90 bed	36.58 cde	35.24 de	47.12 de	59.70 de
B	T1	11.19 ab	45.18abcd	66.02 bed	89.60 bc	107.94 bc	125.80 c
B	T2	11.18 ab	63.66 ab	75.84 abc	94.36 bc	105.75 c	115.96 c
B	T3	9.42 b	87.48 a	114.94 a	160.75 a	208.26 a	246.34 a
B	T4	24.70 a	60.10 ab	87.24 ab	114.75 b	148.26 b	179.16 a
CONTROL	T0	1.41 b	2.59 d	3.29 e	4.04 e	4.45 f	5.96 f
	LSD 5%	14.12	48.51	44.55	44.71	40.45	42.80
Interaction	FERT	Ns	*	*	*	*	*
	TRT	Ns	Ns	ns	*	*	*
	FERTxTRT	NS	NS	NS	NS	NS	NS

Means followed by the same letter (s) within a treatment column are not statistically significant at 5% level of probability

*= Significant

NS= Not significant