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Growth Response of Glossy Nightshade (*Solanum americanum*) Treated with Different Quantity of Compost Manure and Urea in Bali Local Government of Taraba State

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Abstract: ***Solanum americanum*** **a flowering plant commonly known as American black nightshade or glossy nightshade is herbaceous in nature and performs well on most soil types in some region of Africa and Asia. Native farmers in Nigeria do not have adequate knowledge about the required soil fertility for efficient respond to growth. A field experiment was conducted to determine the effect of different levels of urea (0, 50, 100, and 150 Kg/ha) and compost (0, 5, 10 and 15 t/ha) on the growth of *solanum americanum*. The experiment was carried out during mid-November, 2020 to late May 2021 at Federal Polytechnic Bali, Taraba state, Nigeria research farm. Treatments plots were laid out in a completely randomized block design and replicated four times. Data was collected at interval of two weeks for number of leaves, plant height, number of branches and stem girth. Data obtained were subjected to analysis of variance (ANOVA). Significant treatment means were separated using Tukey test at P<0.05. The results showed that the applications of urea and compost significantly (p<0.05) influenced all growth parameters of *Solanum americanum*. The highest rates of compost (150 t/ha) and urea (15 Kg/ha) significantly increased the growth parameters when compared to the control and have the highest mean values for all the parameters measured. The use of urea and compost is therefore essential in increasing the plant growth. Therefore compost and urea is recommended for optimal growth performance.**

Keywords: **compost, urea, plant growth.**

I. INTRODUCTION

The vegetable African Nightshade (vernacular name; kumbi) is a specie of Solanum genus, it's consumed as vegetable both leaf stem and has herbs [1] [2]. They are grown in both lowland and high areas in West and East Africa, particularly in Cameroon and Nigeria [3]. It's also called Black nightshade is a common herb or perennial shrub, found in many wooded areas as well as good habitats. It has a height of 35-115cm, leaves 4-7.5cm long and 2-5cm wide; ovate to heart-shaped with wavy or large toothed edges, both surfaces hairless, petiole 1-3cm long. The flowers have petals greenish to whitish, recurred when aged and surround prominent bright red/yellow anthers. The berry is mostly 6.5-8.5mm diameter, dull black or purple black. In India, another strain is found with berries that turn red when ripe [1, 2, 3].

Glossy nightshade (*Solanum americanum*) localy called Kumbi (Hausa), Azibashwi (Mambila) and Morelle noire (French) is a vegetable and herbaceous Flowering plant [4], [5]. *Solanum americanum* is reported as a cultivated leafy vegetable from Ethopia, the avarage land of Sierra Leone, Uganda, Tanzania, Kenya. The leaves were eaten as a vegetable with a popular wild pot herb in Mambila Plateau in Nigeria, Cote d‟ ivore and Cameroon, eastern and Mozambique [1],[3] young green vegetable shoots are cooked and eaten, after boiling in water in Africa, South America and New Guinea [5].

The younger leaves of Glossy nightshade are boiled as leafy vegetable. Depending on the bitterness, the method of cooking, some water is refreshed and is good for children. It further reduce the bitterness, of the leaves which add together with cooked amaranth, or separate as a mixture [4].

Glossy Nightshade is an annual vegetable short-lived perennial herb, erect and is widely spread and normally grows up to <1– >40 centimeter (39–59 in) tall. The vegetable is common among rocks, along sand beaches, trails, in woodlands and fields, coastal to wet forest, subalpine woodland, disturbed roadsides, pasture, clearings, gardens, cane fields, plantations, on open gravel banks, waste land, thickets, shores or openings, wet places, along margins of puddles, ditches, degraded moist deciduous forest areas and riversides, also in the plains. Stem is rounded or narrowly winged, sometimes warty, glabrous or sparsely pubescent, young stem is sometimes covered with curved, simple hairs. *Solanum americanum* is a variable taxon. It is considered by some botanists to be more than one species, and others recognize subspecies [6].

Sometimes *S. nigrum* is confused for the much more toxic deadly nightshade, Atropa belladonna, in a different *solanaceae genus* altogether [2]. A comparison of the fruit shows that the black nightshade berries grow in bunches while the deadly nightshade berries grow individually. *S. nigrum* is an important ingredient in traditional Indian medicines. Infusions are used in dysentery, stomach complaints and fever [7]. The juice of the leaves is used on Ringworm, ulcers, cooling hot inflammations, testicular swelling, and ear pain [7].

II. LITERATURE REVIEW

Brief Plant History

Solanum americanum is an annual or short-lived perennial plant, erect and widely spreading, growing up to 150 cm tall[8].The plant is used as a vegetable, especially in Africa, where it is often collected from the wild. It is reported as being cultivated in Sierra Leone, the lowlands of Ethiopia, Kenya, Uganda, Tanzania, Seychelles and Mauritius. It is a popular wild pot herb in Côte d'Ivoire and Cameroon, and in eastern Zimbabwe and Mozambique the leaves are also eaten as a vegetable [8].

Plant Habitat

Rocky or dry open woods, thickets, shores or openings, often on cultivated or waste ground in eastern N. America [9]. Waste places, roadsides, fields; at elevations from 100 - 2,000 metres in China [10].

Cultivation of *Solanum americanum*

A plant of the tropics and subtropics, it can also be cultivated in the temperate zone. It is found at elevations up to 2,000 meters in the tropics. It grows best in areas where annual daytime temperatures are within the range 20 - 35°c, but can tolerate 15 - 40°c [8]. It prefers a mean annual rainfall in the range 500 - 1,200mm, but tolerates 400 - 1,500mm [8].Prefers a sunny position but is tolerant of light shade [8]. Succeeds in most soils [11]. Leaf production is best in a fertile soil [8].Plants can escape from cultivation and become a weed [8].Young seedlings grow away quickly and can start flowering about two months after germination [8]. The plant continues to develop new flowers for several months [8].Leaves and stem tops are collected from plants in the wild, or from fields during the rainy season. Harvesting is normally done in the early morning. The main shoot or side shoots are plucked before flowering, leaving at least 5 cm of stem for the production of new side shoots. This method allows 6 - 8 times harvests from the same plant [8].

Method of Propagation

Seed - can be sown in situ, placing the seeds in pockets of up to 10 seeds at the beginning of the rainy season [8]. For commercial purposes, seedlings for transplanting are produced in nurseries. The soil is loosened and enriched with decomposed manure in combination with wood ash. The seeds, in most cases mixed with sand or ash, are dispersed evenly over the soil surface or sown in rows and then mulched with grasses to prevent moisture loss from the soil [8]. Transplanting may take place when the seedlings are about 15cm tall, whereby only strong plants should be selected [8]. The recommended spacing in pure stands is 30 cm × 30 cm, which could be reduced to 20 cm × 30 cm during the dry season [8].

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III. MATERIALS AND METHODS

Study Area

The experiment was conducted in the field within the period of December 2020 to May 2021 irrigation seasons at the Teaching and Research Farm of the Federal Polytechnic Bali. Bali said to covers a land area of about 9,146km^2 which is situated between latitude (7^0 $51^{'}$ $31^{''}$ North and 10^0 $58^{'}$ $18^{''}$ East) of the Greenwich meridian. It share boundaries with Ardo Kola and Gossol local government in the North, Donga and Kurmi in the West and Gashaka local government form the South. It also share border with Adamawa State in the North - East. These area is generally situated on the river banks of the upper course of Taraba River, and is about 150km to Jalingo the state capital. The experimental site had been used for groundnut crop production for over a year under rain fed without any application of fertilizer. The treatments applied to glossy nightshade was (O Control) 2.5, 4.5, 6.5, t/ha of composed.

The experiment was laid out in randomized complete block design (RCBD) with each treatment replicated four times. The compost were well composts under shade for tree month before used. The compost incorporated into soil one weeks before transplanting take place. Before applying the compost, composite soil samples were taken from the gross plot area for routine analysis in the laboratory**.** The seeds of Glossy Nightshade were sourced from farmer's seed banks in Gumbu and was broadcast in a prepared nursery bed measuring 3m x 3m (9m^2).The seed bed were mulched and irrigated daily for two weeks before transplanting take place into unit plots measuring 2m x 2m (4m^2) at a spacing of 10 cm x 20 cm. Weeding of the plots was carried out manually using hoe at 3 and 7 weeks after transplanting. Harvesting of the Vegetative parts was carried out at 6weeks by cutting with a sharp Knife 4-5cm above the ground at two week interval, 2-4 times before flowering and seeding.

Land Preparation and Soil sample collection

The field for this research work was properly cleared, ploughed before harrowing was done to further pulverize the soil. Prior to planting, four different soil samples were randomly collected at the depths of 0 and 10cm using a hand auger. Each of the four soil samples were separately labeled and air-dried then crushed to enable it pass through a 2mm sieve and taken to the laboratory for both physical and chemical analysis to determine the amount of nutrient present before the application of compost and urea.

Laboratory analysis

In the laboratory, each Soil sample collected was analyzed for soil pH using a pH meter at the ratio of 1:2.5 (soil: water) as described by McLean [12]. The Cation Exchange Capacity and Exchangeable Bases (CEC) of the soil was determined using the ammonium acetate saturation method as described by Chapman [13]. Total nitrogen was determined by micro-Kjeldahl digestion-distillation method as described by Bremner and Mulvaney [14]. Available P was extracted by the Bray-1 procedure [15]. The organic carbon was determined using Wakley and Black method [16]. DTPA extractable micronutrients in all soil samples were determined using the procedure by Lindsay and Norvell [17]. Samples of the mature compost made from cattle manure and house wastes and dried grass were taken for laboratory analyses in order to determine their nutrient composition. Before analysis, the compost samples were air dried and ground to pass through a 2 mm sieve. The samples were then analyzed for pH, total N, total P, organic carbon and exchangeable bases (K^+, Ca^{2+}, Mg^{2+} and Na^+) in the laboratory using standard methods [18].

Data Collection

Data collected was soil samples, compost manure, growth parameters and yield. Soil, compost manure chemical analysis compost manure samples were collected and analyzed to determine their physical and chemical properties. On four tagged plants parameters used were plant height, number of branches, width and number of leaves/ha. The plant parameters was taken from any 3 randomly selected plants from each plot.

Statistical analysis

Data collected on the growth parameters are subjected to analysis of variance (ANOVA). The Significant treatment means were separated using Tukey test at P=0.05 level of confidences.

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IV. RESULTS AND DISCUSSION

Table 1: Data for soil and compost essential nutrient and soil, chemical characteristics

Essential Nutrient	Soil Sample	Compost Manure
Total N	0.31%	3.46%
Avail. P	42.4cmol/Kg	17.90cmol/Kg
Na	0.84cmol/Kg	0.95cmol/Kg
K	3.98cmol/Kg	2.68cmol/Kg
Mg	1.86cmol/Kg	1.64cmol/Kg
Ca.	14.01cmol/Kg	3.41cmol/Kg
PH	4.98	9.34
Organic C	20.63%	2.5%
CEC	43.7cmol/kg	17.6cmol/kg

From the table above, the compost manure has a higher percentage of nitrogen and both the soil and the compost are significantly reach in other essential nutrient for plant growth. The data obtain above indicates that the value for pH, organic content and cation exchange capacity is higher in the compost manure when compared with that of the soil collected from the experimental site. This mean that addition of the compost manure will assist in improving the soil fertility and crop yield. The soil is slightly alkaline in nature while the compost manure is acidic at its maturity state going by the result in the table above.

Results on the growth responses of *S.americanum* treated with urea and compost manure

Table 2: The effect of urea on the growth of Glossy nightshade

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	17.349	3	5.783	1.302	0.339
Within Groups	35.540	8	4.442		
Total	52.889	11			

From table two above, the result indicates an influence on the mean at wk 6-8 on the plant height, number of leaves and numbers of branches, between and within the group with the calculated as (1.302) which is less than F tabulated at 95% level of confidence. The result revealed that urea has no significant effect on the growth of glossy nightshade. The result indicate that increase in the quantity of urea might increase the growth of glossy nightshade.

Table 3: The effect of compost manure on the growth of Glossy nightshade

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2562.581	2	1281.291	2.653	.124
Within Groups	4347.356	9	483.040		
Total	6909.937	11			

The result of the analysis as presented in Table 3 above, shows a significant value of (.124) which is less than F tabulated at 95% level of confidence. This implied that the significant value and p value is greater than 95%. These result shows that compost manure has no significant effect on the growth of glossy nightshade. This indicate that increase in the quantity used of compost manure applied might give a slight improvement on the growth of glossy nightshade in the study area.

Table 4: Effects of different of level compost manure and urea on growth of glossy nightshade plant

LEVELS	4 Weeks After Planting				6 Weeks After Planting				8 Weeks After Planting			
	PH	NLF	NBR	SG	PH	NLF	NBR	SG	PH	NLF	NBR	SG
L1	10.50^{c}	7.00^{a}	3.50^{b}	2.15^{a}	12.35^{c}	9.50^{a}	5.50^{b}	2.25^{a}	15.25^{a}	15.00^{a}	10.00^{a}	3.00^{a}
L2	13.20^{b}	9.50^{a}	5.50^{b}	3.15^{a}	14.40^{b}	11.00^{a}	8.50^{ba}	3.40^{a}	18.90^{a}	17.00^{a}	12.50^{a}	3.45^{a}
L3	14.75^{ba}	11.50^{a}	8.50^{a}	3.35^{a}	15.75^{b}	13.00^{a}	9.50^{ba}	3.70^{a}	21.00^{a}	18.50^{a}	15.00^{a}	3.50^{a}
L4	16.45^{a}	15.50^{a}	13.50^{a}	3.10^{a}	17.65^{a}	17.50^{a}	12.00^{a}	3.50^{a}	22.50^{a}	22.00^{a}	16.50^{a}	3.80^{a}
Mean	13.73	10.88	7.75	2.94	15.04	12.75	8.88	3.24	19.41	18.13	13.50	3.44
S.e (±)	0.84	1.51	1.49	0.23	0.74	1.42	0.97	0.22	1.41	1.13	1.16	0.17

The application of urea is significantly (P≤0.05) produced highest growth with means of plant height (19.41) and number of leafs (18.13) respectively. Increasing the rates significantly increased the growth of the plants. While the control plots produced the lowest number of leave per plant stand. This result is similar to [3]. The plant height, number of leaf and stern girth of Glossy nightshade were all influenced by compost manure application with significant (P≤0.05) increase in leaf length and wideness of leaves. The application of 150kg of compost manure per hectare significantly produced longer leaves and wider leaves, this is in line with the result of [3]. There is a significant increase in number of leaves and plant height observed with application of urea as compared with the control, these might be due to increased Nitrogen content. This might be because of the efficient use of the urea at this rate by the plants.

V. CONCLUSION

The growth response of Glossy nightshade was observed to give some positive efficacy at the application of both urea and compost manure. However, the best performance was obtained in some replicate incorporated with the nutrient at the peak level of both treatments. The growth response can be improved for both treatment in future use and sustainable productivity by adjusting them to a higher levels. *Solanum americanum* was seen to show some similar growth response at the mid- stage of growth for both treatment block in the study area. The study therefore recommends that further research should be carry out on how urea and compost manure affects the nutritional and economics value of the crop in the future**.**

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