EFFECT OF FERTILIZER APPLICATIONS ON THE GROWTH AND TUBER YIELD OF SWEET POTATO CULTIVARS IN NORTHERN AND SOUTHERN GUINEA SAVANNA

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Abstract: field experiments were conducted for two consecutive years (2022, and 2023) raining seasons in Teaching and Research Farm of both the Federal University Wukari and Taraba State University Teaching and Research Farm Jalingo, to determine the growth and tuber yield of sweet potato as influence by fertilizer treatments. using three varieties. Jalingo local, Donga white local and Tropical Ipomoea Selection (TIS-91/198) (V1, V2 and V3) respectively and five fertilizer treatments (Control, Poultry Manure, N:P: K 15:15:15, Cow Dung and Urea). The treatments were factorial, arranged in 3x2x5 randomized complete block design replicated three times. Results of the experiment shows that both main effects (variety and fertilizer treatments) had significant influence on all the parameters measured vis: length of primary vine (cm), number of secondary vine, number of leaf, number of tuber per plant, length of tuber (cm), tuber size (cm), weight of tuber per plant (kg) and tuber fresh yield per hectare (ton/ha) except number of node and leaf area which was not significantly influenced by variety and fertilizer treatments. Fertilizer treatment enhanced growth and yield performance on the varieties used. Highest value in all the yield characters measured was observed in Donga local variety at fertilizer treatment of poultry manure and NPK (10t/ha and 60kg/ha respectively). Generally, all traits except number of nodes and leaf area were significantly ($p<0.05$) affected by the interactive effect of variety and fertilizer treatment indicating that determining fertilizer treatment for each variety by considering their vegetative growth and yield habit is very important in crop production. Further research should be repeated on variety selection and fertilizer treatments under cropping season at different locations in southern and northern guinea savanna of Taraba State.

Keyword Sweet potato, fertilizers treatment, location and varieties

Introduction

Sweet potato (*Ipomoea batatas* (L)) is herbaceous dicotyledonous plant, it is commonly called morning glory and it is the only member of the genus *ipomoea* whose roots are edible. It is widely grown in tropical, subtropical and warm temperate regions of the world (Xi and Waana, 2022). Sweet potato is an important root crop serving as food, feed and raw material globally (Peter and Michael., 2023).

According to Berberich *et al*. (2005), the crop has several industrial uses, including medicinal purposes; use for treating diabetes, hookworms, ulcer and internal bleeding. Its role as a cash crop is significantly increasing due to the crop's high yield potential and ability to grow in a wide range of environments (Chiona, 2009; Wang *et al*., 2011; Adeyonu *et al*., 2017).

Fertilizer is one of the most important inputs either as organic or inorganic for increasing the productivity of crops (Ali *et al*., 2009).

Leytem and Westermann (2005) reported the effects of fertilizer on the yield of potatoes. Although inorganic fertilizer when applied to crop usually has a quick-release formula making nutrient rapidly available to plants. Despite the fact that using inorganic fertilizers has been reported to give high yields, the high cost and its long time adverse effect on soil chemical properties, makes the use of organic fertilizer more environmental friendly and it supply both macro and micro nutrients to the soil (Negassa *et al*., 2001; Tirol-padre *et al*., 2007) and also improve the physio-chemical properties of the soil.

Use of manures is a method of boosting fertility (Adeyeye *et al*., 2016). Organic farming is the form of agriculture that relies on the use of compost, green manure and minimize the use of synthetic farm inputs. Land application of animal manure is efficient utilization alternatives because of lower costs, Manure nutrients help build and maintain soil fertility. Manure can also improve soil tilt, increase water holding capacity, lessen wind and water erosion, improve aeration and promote beneficial micro-organisms (Adeyeye *et al*., 2016).

Despite its importance as a food crop, the yield of sweet potato has remained low due to the adverse effect of biotic and abiotic factors coupled with poor management practices such as wrong usage of fertilizer. Growers of sweet potato in Nigeria are faced with a number of problems in trying to improve the yield and quality of the crop (Balogun *et al*., 2021).

Sweet potatoes require a balanced supply of nutrients for optimal growth and tuber development. Understanding the optimal application rates and timing (e.g., basal vs. split application) can ensure efficient nutrient use, reduce environmental impact, and enhance yield. Combining vine planting patterns with strategic fertilizer application can lead to synergistic effects: Vertical planting may be more effective when coupled with split fertilizer applications, providing consistent nutrient availability that matches the growth stages of the plant (Ukom, *et al*., 2009).

Proper variety and fertilization can reduce the risk of low yield, and also increase the tuber yield. Research on these combined practices can provide comprehensive guidelines for farmers, leading to more sustainable and productive sweet potato farming.

This study has the potential to provide valuable insights that can significantly impact food security and economic stability in sweet potato-growing regions.

In view of the above findings, this study was conducted to evaluate the best cultivar with the best vine method of planting and different fertilizer sources for the growth and tuber yield of sweet potato in this environment with the following objectives.

Objectives of the Study

1. Determine the effect of fertilizer treatments such as Poultry manure, Cow Dung, NPK 15:15:15 and Urea on the growth and tuber yield of sweet potato
2. Study the interactive effect of varieties, and different fertilizer treatments on sweet potato (*Ipomea batatas*). growth and development.

Materials and Methods

Experimental Site

The experiment was carried out at the Teaching and Research Farm, Federal University Wukari (Southern Guinea Savannah) It lies between latitude 7.8^0 – 8.2^oN and longitude 9.3^o – 10.5^oE with an average elevation of 200/masl. and Teaching and Research Farm, Taraba State University, Jalingo (Northern Guinea Savannah) the local government area lies between latitude 8.30^0 – 9.10^oN of the equator and longitude 10.58^o – 11.30^oE. Taraba State lies between latitude 6·30ºN - 9.30^0N of the equator and between longitude 9 60ºE - 12· 90º E of the Greenwich meridian with a land mass of 54,426km^2. It shares boarders with Bauchi and Gombe State in the North, Adamawa State in the East and Cameroon Republic in the south west. The state has a tropical wet – dry climate, well drained alluvial soils and has both savannah and Rain forest vegetation. The rainfall ranges between1000mm to 2500mm per annum in the north with the driest and wettest season lasting from December to February and July to September respectively (Peel *et al*., 2007).

Soil Sampling and Analysis

Composite soil samples were collected, using an auger at 0-15 cm depth at different locations of each experimental sites. The soil sample was bulked, grinded, dried and analysed in the laboratory for its physical, chemical properties.

Organic manure preparation

The poultry manure and cow dung manure were bulked, grinded, air dried, and put into jute bags after being separated from stones and other debris. A sample was taken to laboratory for analysis. The sample were digested and subjected to chemical analysis to ascertain the nitrogen, phosphorus, potassium, calcium, magnesium contents. The decomposed and dried organic manure was applied and work into the soil two weeks before planting of vines.

This experiment was carried out in two (2) locations i.e Wukari and Jalingo, to evaluate the response of three cultivars of sweet potato to fertilizer applications and two vine methods of planting.

Experimental Design and Treatments

The experimental design was 3 x 5 factorial, arranged in randomized complete block design (RCBD) with three replications. The total land area for the experiment was 41 m x 51 m = 2091 m^2, with the total of 90 beds in the field, the size of the gross plot was 4 m x 3 m = 12 m^2 with a spacing of 1 m x 50 cm and each plot was having 24 plants stands, the net plot was 2 m x 2 m = 4 m^2. There was 1m pathway between plots and 2 m between replications.

The treatments consisted of three cultivars of sweet potato (Jalingo local, Donga white local and TIS-91/198) from the experiment 1 with two planting patterns (direct and ring method), and organic fertilizers namely: poultry manure(10t/ha), cow dung(10t/ha) and inorganic fertilizers namely; NPK 15:15:15(60kg/ha) and Urea Fertilizer(45kg/ha) with a control(0kg/ha).

Cultural Practices

Land preparation; The field was ploughed, demarcated and beds raised. The 4 m x 3 m plot area was laid with bed, the beds were manually constructed with a hoe.

Planting; Sweet potato vine cuttings were planted on the plot using the direct pattern of vine planting.

***Fertilization*;** The organic manure was Applied to the soil two weeks before planting, NPK (15:15:15) and urea fertilizers were applied two (2) weeks after planting. This was applied 5cm deep and 5cm away from the vine plants. Both inorganic (NPK15:15:15, Urea) and organic (poultry, cow dung manure) were applied at appropriate recommended rates (60kg/ha, 45kg/ha, 10t/h and 10t/h) respectively as per treatments.

Weeds; was control in both experiments at 4 weeks after planting, using cutlass and hand hoeing method before close of the canopy and to reduce competition with crops. Subsequent weed control was by hand pulling and reshaping of beds. The plants were allowed to grow, develop till maturity.

Data Collection

Growth Parameters

Five plants from each net plot were randomly selected and tagged for collection of data during crop growth. Measurement of growth parameters were made at three weeks intervals. Destructive samplings were carried out from the discard.

Length of the Primary Vine per plant

Length of primary vine was determined by measuring the length from the base directly above the ground to the terminal bud of the tagged plants using measuring tape. The primary vine lengths were added and the average was recorded. This was determined at 3, 6, 9 and 12 weeks after planting (WAP)

Number of Leaves per Plant

Numbers of leaves per plant at 3, 6, 9 and 12 WAP were determined by counting the number of leaves from each tagged plant. The average was recorded.

Number of Secondary Branches per Plant

Number of secondary vines per plant was determined by counting the number of secondary branches on tagged plants. The total of five plants was divided by five for the average. This was determined at 3, 6, 9 and 12 WAP

Number of Nodes per Plant

Numbers of nodes per plant at 3, 6, 9 and 12 WAP were determined by counting the number of nodes on tagged plants and the mean was recorded.

Leaf Area

Leaf area per plant was estimated by measuring the five sampled plants on each plot using measuring tape, with the formula LA= y0 + (a x L) + (b x W)

Leaf Area index

Leaf area per plant was measured, from the five sampled plants on each plot using measuring tape, Leaf area was calculated according to Schrader *et al*. (2021) by the formula: Area = length x width x correction factor (0.55 - 0.79)

Yield Components

Number of Tuber per Plant

The number of mature tubers was counted from five randomly tagged plants in each of the plot and the mean were recorded.

Weight of Tuber per Plant

The tuber from the five tagged plants were weighed using the weighing scale and the average were recorded per plant.

Weight of Tuber per Hectare

The tubers from each harvested net plot were weighed using Metler Toledo SB16001 electronic digital weighing scale, then converted to tonnes per hectare and recorded.

Length of Tuber per Plant

Five plants were selected randomly from each of the plot at harvest. The tubers were measured using measuring tape and ruler, after which the total measurements of the five tubers were summed up and divided by five for the average.

Tuber Size (girth) per Plant

The tuber harvested from the plot at harvest. The tubers were measured using callipers, after which the selected tagged plant was summed up and the average was recorded.

Meteorological Data

Meteorological data on the temperature, sunshine, rainfall, evapotranspiration and relative humidity for the experimental sites were obtained from the metrological units of both locations.

Data Analysis

Statistical Analysis

The Data collected were subjected to analysis of variance (ANOVA) appropriate for randomized complete block design. GenStat was used to determine the significance of the F- test and the treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level Daffaallah, (2017).

Result and Discussion

***Effect of fertilizer treatment on length of primary vines at all growth stages of sampling at Wukari and Jalingo in 2022 and 2023 cropping seasons*.**

The length of primary vine for fertilizer treatment at Wukari showed a significant ($P<.005$) different at all sampling weeks except at 3 weeks after planting (3WAP). At 6 weeks after planting (WAP), poultry manure significantly produced the highest length of primary vine (107.10) followed by NPK 15:15:15 (92.80 cm), and Cow dung (80.40 cm) while Urea gave the least (67.50 cm).

At 9 weeks after planting Poultry manure gave the significant higher length of primary vine (291.70 cm) followed by NPK 15:15:15 (237.20 cm), Urea (209.90 cm) while the least was recorded for Control (190.40 cm). However, at 12 weeks after planting it was NPK 15:15:15 that gave the highest primary vine (276.00) follow by Poultry manure (260.80 cm) and Cow dung (255.50 cm).

Furthermore, at Jalingo there was a significant different in the length of primary vine at all sampling stages. At 3 weeks after planting, Urea and NPK 15:15:15 gave the significant higher length of primary vine (55.20 cm and 48.90 cm) respectively followed by Cow dung and Poultry manure (48.30 cm and 46.60 cm) and the least length of primary vine was recorded for Control (35.60 cm).

At 6 weeks after planting, Poultry manure and Cow dung significantly produced the highest length of primary vine (133.50 cm and 133.30 cm) respectively followed by NPK 15:15:15 (121.80 cm), and the least was from Control (84.40 cm).

At 9 weeks after planting (WAP), both Poultry manure, Cow dung and NPK 15:15:15 had the highest length of primary vine (243.00 cm, 232.20 cm and 227.60 cm) respectively, and the lowest value was for Control (172.80 cm). While at 12 weeks after planting (WAP), it was observed, that Poultry manure significantly produced the highest length of primary vine (299.00) followed by NPK 15:15:15 and Cow dung (257.00 and 252.40) respectively and the least length of primary vine was recorded for Control (204.80) (table 1).

The number of secondary vines (Table 2) on fertilizer treatment at 3, 6 and 9 weeks after planting in Wukari, showed no significant different except at 12 weeks after planting that record NPK 15:15:15 as the highest number of secondary vines follow by Poultry Manure when compared to other fertilizer treatments used.

While at Jalingo the fertilizer treatment on number of secondary vines produced, was significantly different with mean value for Cow Dung having the highest number value of secondary vine at 6 weeks after planting followed by Poultry manure, NPK 15:15:15, and Urea, while the lowest mean value was recorded for Control.

Similarly, at 9 weeks after planting NPK15:15:15, Poultry manure, Cow dung and Urea recorded the highest value of number of secondary vines. But at 12 weeks after planting, there was no significant different when compared with other fertilizer treatments used in the study.

The performance in number of nodes (Table 3) at 3, 6, 9 and 12 weeks after planting, in Wukari was significantly higher in NKP 15:15:15 (6.36, 96.80, 190.50 and 418.90) respectively, follow by Poultry Manure (6.22, 92.00, 182.40 and 395.30) and Cow Dung (5.75, 82.80, 163.80 and 393.60) respectively when compared with other fertilizer treatments used. The least value was recorded at Control (4.25, 47.70, 104.70 and 241.20).

Furthermore, at Jalingo the number of nodes produced was significantly different for Poultry Manure (198.70 and 453.40) having the highest node value at 9 and 12 weeks after planting follow by NKP (196.50 and 404.40). At 6 weeks after planting NPK (81.90), Poultry Manure (76.10), Cow Dung (70.10) had the highest value respectively and the least was produced by Urea (60.90). But there was no significant difference at 3 weeks after planting, although there was significant different in the mean value for Control, Cow dung, NPK 15:15:15, Poultry manure and Urea (4.64, 4.53, 4.44, 4.42 and 4.28) respectively in the study.

The number of leave at 3 weeks after planting in Wukari was significantly higher in fertilizer treatment (poultry manure (8.58), N.P.K 15:15:15 (8.31), Cow Dung (7.69), Urea (7.31) and Control (5.78)). But at 6, 9 and 12 weeks after planting, the number of leaves was significantly higher in fertilizer treatment NPK 15:15:15 (100, 198 and 452), Poultry manure (89.90, 180.10 and 402.40), Cow dung (85.10, 164.20 and 368.10) respectively. While the significantly least number of leave was produced by fertilizer treatment control, which is okg/ha (Table 4).

At Jalingo, the number of leave produced in plants, was significantly difference with NPK 15:15:15 (86.10 and 199.00) having the highest value at 6 and 9 weeks after planting, follow by poultry manure (84.94 and 190.10), cow dung (70.94 and 170.80) respectively. But at 12 weeks after planting, poultry manure (432.10) significantly had the highest number of leaves, followed by NPK 15:15:15 (402.60), cow dung (384.70), urea (280.20) respectively. While the least value was recorded in control (261.60) (Table 4).

Table 5 showed the leaf area on fertilizer treatment at 3, 6 and 9 weeks after planting in Wukari, showed no significant different except at 12 weeks after planting that record NPK 15:15:15 as the highest leaf area follow by Poultry Manure when compared to other fertilizer treatments used.

While at Jalingo the fertilizer treatment on leaf area produced, was significantly different with mean value for Cow Dung having the highest number value of leaf area at 6 weeks after planting followed by Poultry manure, NPK 15:15:15, and Urea, while the lowest mean value was recorded for Control.

At 9 weeks after planting NPK15:15:15, Poultry manure, Cow dung and Urea recorded the highest value of leaf area. But at 12 weeks after planting, there was no significant different when compared with other fertilizer treatments used in the study.

At Wukari, application of NPK 15:15:15 fertilizer and Cow dung manure, produced, significantly highest, number of tubers, which are similar statistically to Urea application in the study. While the weight of tuber recorded was significant higher, in plants that was treated with poultry manure, and NPK 15:15:15 fertilizer, but these are statistically similar to Cow dung and Urea fertilizer treatment, while the least tuber weight was recorded for the control treatment.

Poultry manure and NPK 15:15:15 fertilizer treatment, also produced, the highest tuber yield followed by Cow dung and Urea, while the least tuber yield came from the control treatment. The mean performance at Jalingo, however, Cow dung manure, treatment produced the highest number of tubers, followed by poultry manure and NPK 15:15:15 fertilizer which are similar statistically to the Cow dung treatment, and the lowest number of tubers was from the control.

The weight of tuber recorded for sweet potato, at Jalingo indicated that, Poultry manure, had the highest significant tuber weight although this value is similar statistically to the application of NPK15:15:15 fertilizer and Cow dung tuber weight values, recorded in the study, and the least came from the control treatment. There exists significant ($p<0.05$) poultry manure significantly influenced the length of tuber and sizes of tuber per plant followed by NPK in both length and tuber size at all sampling points compare to other treatments used in the study.

Furthermore, the application of Poultry manure produced significantly highest tuber yield (37.69t/ha) followed by NPK 15:15:15 fertilizer (31.97t/ha), while this value is statistically similar to the Cow dung manure (26.75t/ha) and Urea fertilizer (22.42t/ha) values respectively. Control treatment produced the least (18.87t/ha) tuber yield in the study compared with other treatments used (Table 6a and 6b below).

Fertilizer treatments improved the Sweet potato growth and tuber yield attributes such as vine length, secondary vine, leaves, nodes, number of tuber, weight of tuber and yield/ha were significantly influenced by application of fertilizer and this result is better than the control (0kg/ha) treatment in the study.

Sweet potato was affected at the various growth periods by fertilizer application for poultry manure and NPK consistently recorded the highest growth parameter at all sampling periods. This observation could may be due to the supply of adequate or essential nutrients at the right time, by those two treatments. This result is in total agreement to the findings reported by Satapathy *et al*. (2005) and Mitra (2012) who noted that, adequate supply of fertilizer to plant encourage vine growth and storage root development.

Fertilizer treatment also increases the yield components of sweet potato in this study, poultry manure and NPK 15:15:15 treatment constantly had the highest yield performance. This may be due to the ability of the plant to utilized the fertilizer applied for physiological and biochemical reactions. It may also be due to supply of essential nutrient needed by the plant. Similar result has been previously reported by Byji (2004) who reported that fertilizer is needed as an important nutrient for the development of storage root yield increases and the storage root enlargement occurs when the nitrogen to potassium ratio is in average because high nitrogen concentrations promotes vine growth and also affect storage roots.

The highest yield of fertilizer treatment was observed for poultry manure and NPK when compared to other fertilizer treatments used in the study.

Table 1. Effect of fertilizer treatment on length of primary vines of sweet potato at all growth stages of sampling at Wukari and Jalingo 2022 and 2023 cropping seasons.

	Wukari				Jalingo			
Fertilizer Treatment	3wap	6wap	9wap	12wap	3wap	6wap	9wap	12wap
Control (okg/ha)	45.10a	73.10c	190.40c	241.20b	35.60c	84.40b	172.80b	204.80c
Poultry manure(10t/h)	47.40a	107.10a	291.70a	260.80ab	46.60b	133.50a	243.00a	299.00a
NPK (60kg/ha)	46.60a	92.80ab	237.20b	276.00a	48.90a	121.80ab	227.60ab	257.00b
Cow Dung(10t/ha)	52.80a	80.40bc	197.80c	255.50ab	48.30ab	133.30a	232.20a	252.40b
Urea (45kg/ha)	43.80a	67.50c	209.90b	251.90b	55.20a	85.00b	177.40b	220.40c
Mean	47.26	84.18	225.40	257.08	47.10	111.60	210.60	246.72
SE	35.19	72.11	210.86	222.45	41.90	94.67	199.89	231.44

Values with different letters along the columns are significantly different using DMRT at 5% probability level ($p<0.05$).

Table 2. Effect of fertilizer treatment on the number of secondary vines of sweet potato at all growth stages of sampling at Wukari and Jalingo 2022 and 2023 cropping seasons.

	Wukari				Jalingo			
Fertilizer Treatment	3wap	6wap	9wap	12wap	3wap	6wap	9wap	12wap
Control (okg/ha)	1.44a	4.25a	7.03a	8.42c	1.28a	4.22a	7.58b	10.00a
Poultry Manure (10t/ha)	1,19a	4.78a	11.69a	10.94ab	1.47a	4.86a	8.53a	10.97a
NPK (60kg/ha)	1.42a	4.53a	8.47a	11.14a	1.40a	4.81a	8.64a	10.99a
Cow Dung (10t/ha)	1.25a	4.36a	7.47a	9.42c	1.28a	5.00a	8.17ab	10.64a
Urea (45kg/ha)	1.22a	4.19a	7.42a	9.83c	1.42a	4.78a	7.81ab	9.94a
Mean	1.31	4.45	8.11	9.13	1.37	4.51	8.44	10.54
SE	0.91	3.22	6.11	7.45	1.12	3.88	5.80	7.56

Values with different letters along the columns are significantly different using DMRT at 5% probability level.

Table 3. Effect of fertilizer treatment on the number of nodes of sweet potato at all growth stages of sampling at Wukari and Jalingo in 2022 and 2023 cropping seasons.

	Wukari				Jalingo			
Fertilizer Treatment	3wap	6wap	9wap	12wap	3wap	6wap	9wap	12wap
Control(0kg/ha)	4.25b	47.70c	104.70c	241.20c	4.64a	61.20b	155.40b	248.10b
Poultry Manure (10t/ha)	6.22a	92.00a	182.40a	395.30ab	4.42a	76.10ab	198.7a	453.40a
NPK (60kg/ha)	6.36a	96.80a	190.50a	418.90a	4.44a	81.90a	196.50a	404.40ab
Cow Dung (10t/ha)	5.75ab	82.80ab	163.80ab	393.60ab	4.53a	70.10ab	173.30ab	393.60ab
Urea(45kg/ha)	5.28ab	79.00ab	149.90b	261.70bc	4.28a	60.90b	149.90b	261.70b
Mean	5.61	78.66	164.04	341.51	4.46	69.94	173.19	346.57
SE	3.27	64.22	123.32	288.91	3.09	58.89	164.86	298.72

Values with different letters along the columns are significantly different using DMRT at 5% probability level.

Table 4. Effect of fertilizer treatment on the number of leave of sweet potato at all growth stages of sampling at Wukari and Jalingo in 2022 and 2023 cropping seasons.

	Wukari				Jalingo			
Fertilizer treatment	3wap	6wap	9wap	12wap	3wap	6wap	9wap	12wap
Control (0kg/ha.	5.78b	45.30c	106.60c	240.00c	8.33a	53.56c	131.80c	261.60b
Poultry manure (5t/ha.)	8.58a	89.90ab	180.10ab	402.40ab	8.50a	84.94a	190.10a	432.10a
NPK (60kg/ha.)	8.31ab	100.00a	198.00a	452.10a	7.86a	86.17a	199.00a	402.60a
Cow dung (6t/ha.)	7.69ab	85.10ab	164.20b	368.10b	8.17a	70.94b	170.80b	384.70ab
Urea (45kg/ha.)	7.31b	78.40b	153.60b	351.00bc	9.94a	65.44b	153.60bc	280.20ab
Mean	7.49	78.51	160.50	362.72	8.22	72.21	169.06	352.24
SE	6.04	72.88	101.33	342.00	6.99	68.32	148.02	269.48

Values with different letters along the columns are significantly different using DMRT at 5% probability level.

Table 5. Effect of fertilizer treatment on the leaf area of sweet potato at all growth stages of sampling at Wukari and Jalingo in 2022 and 2023 cropping seasons.

	Wukari				Jalingo			
Fertilizer Treatment	3wap	6wap	9wap	12wap	3wap	6wap	9wap	12wap
Control (okg/ha)	101.44a	114.25a	117.03a	208.42c	101.28a	114.22a	127.58b	210.00a
Poultry Manure(10t/h)	101,19a	114.78a	121.69a	210.94ab	101.47a	114.86a	128.53a	210.97a
NPK (60kg/ha)	101.42a	114.53a	118.47a	211.14a	101.40a	114.81a	128.64a	210.99a
Cow Dung (10t/ha)	101.25a	114.36a	117.47a	209.42c	101.28a	115.00a	128.17ab	210.64a
Urea (45kg/ha)	101.22a	114.19a	117.42a	209.83c	101.42a	114.78a	127.81ab	209.94a
Mean	101.25	114.56	118.60	209.87	101.37	114.76	128.44	210.45
SE	94.65	102.08	111.89	207.45	98.99	108.77		

Values with different letters along the columns are significantly different using DMRT at 5% probability level.

Table 6a. Effect of fertilizer treatment on yield and yield components of sweet potato, at harvest in Wukari in 2022 and 2023 cropping seasons.

Fertilizer Treatment	Numbers of tuber / plant	Wukari Weight of tuber / plant (kg)	Length of tuber/ plant (cm)	Tuber size/plant (cm)	Tuber yield per hectare (t/h)
Control(0kg/h)	3.64c	1.93c	3.89b	4.65b	18.87c
Poultry manure(10t/h)	5.31ab	3.78a	7.26a	7.89a	37.69a
NPK (60kg/h)	5.08ab	3.04ab	6.89a	7.00a	31.97b
Cow dung(10t/h)	5.97a	2.70ab	5.16ab	5.76ab	26.75bc
Urea(45kg/h)	4.53b	2.20c	4.65b	5.22b	22.42bc
Means	4.91	2.31	5.89	5.89	27.54
SE	2.90	1.54	4.10	3.99	24.78

Values with different letters along the columns are significantly different using DMRT at 5% probability level.

Table 6b. Effect of fertilizer treatment on yield and yield components of sweet potato, at harvest in Jalingo in 2022 and 2023 cropping seasons.

Fertilizer Treatment	Numbers of tuber/ plant	Weight of tuber / plant	Length of tuber / plant (cm)	Tuber size/plant (cm)	Tuber yield per hectare (t/h)
Control (0kg/h)	4.17b	1.61b	3.43b	4.11b	16.08c
Poultry manure(10t/h)	4.33b	2.67a	6.88a	7.66a	26.69a
NPK (60kg/h)	5.86a	2.66a	6.65a	7.45a	26.64a
Cow dung (10t/h)	5.67a	2.28ab	5.76ab	5.70ab	22.83b
Urea (45kg/h)	5.22ab	2.06ab	5.44ab	5.05b	20.58b
Means	5.01	2.26	4.89ab	5.45b	22.56
SE	4.12	2.00	3.66	4.33	19.79

Values with different letters along the columns are significantly different using DMRT at 5% probability level.

Conclusion

In conclusion two of the main objectives of this research was to evaluate the performance of the varieties and the type of fertilizer for the crop in southern and northern guinea savanna of Taraba State. It will give an opportunity for farmers to select the higher yield variety and fertilizer suitable for their agronomic practices.

This research had identified Donga white local and TIS-hybrid significantly (p<005) had highest values in terms of growth and tuber yield performance. Donga purple was the least in terms of growth and yield values. It was also observed that, application of poultry manure to sweet potato crop gave the highest significant (p<005) tuber yield performance.

Comparing the result of the southern and northern guinea savanna, it was observed that, southern guinea savanna performed better than the northern guinea savanna in the study.

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