GROWTH RESPONSE AND CARCASS CHARACTERISTICS OF FINISHER BROILER CHICKEN FED SWEET POTATO (*Ipomea Batatas*) LEAF MEAL AS PARTIAL REPLACEMENT FOR SOYA BEAN

[1*]Agyo, B., [2]Lakurbe, O. A., [2]Inuwa, I., [3]Begel, B. J., [3]Mohammed, F., [1]Isah, A. and [1]Yusuf, A. A.
[1]Department of Agricultural Education, Federal College of Education (Technical), Gombe
[2]Department of Animal Science, Federal University, Kashere
[3]Department of Agricultural Technology, Federal College of Horticultural Technology, Dadin–Kowa
Corresponding Author: agyobaku@fcetgombe.edu.ng; 07030396095

ABSTRACT
A four-week feeding trial was conducted with one hundred and twenty-eight unsexed Ross 308 (Agrited Strain) broiler chicken to evaluate the effect of feeding sweet potato leaf meal (SPLM) as partial replacement for soya bean on the growth performance, carcass and internal organs characteristics of broiler chicken. Four experimental diets were formulated with SPLM partially replacing soya bean at 0, 10, 20 and 30% in the diet and tagged as diets 1 (control), 2, 3 and 4 respectively, for finisher (20%CP) phase. The birds were randomly allotted to the dietary treatments with four replications of 32 birds per treatment in a completely randomized design (CRD). Feed and water were supplied ad libitum throughout the experimental period. At the end of the feeding trial, eight birds per treatment were selected for carcass and internal organs characteristics. Results showed that daily weight gain was influenced by the dietary treatment 23.10 – 50.24; P<0.001), FCR was also affected (2.39 - 4.79; P<0.05). However, daily feed intake was not influenced by the dietary treatments. All the carcass and internal organs parameters measured were not significantly (P>0.05) affected and did not follow a definite pattern. Therefore, it can be concluded that inclusion of SPLM in finisher broiler chickens' diet at 10% has no adverse effects on the performance and carcass characteristics of broiler chicken.
Keywords: Broiler chickens, Carcass characteristics, Performance, Sweet Potato Leaf Meal (SPLM).

INTRODUCTION

The Nigerian poultry industry plays important economic, social and cultural roles, contributing meaningfully to meat and egg supplies as sources of high-quality animal protein that contain a low proportion of cholesterol and fats (Sulaiman *et al.,* 2024). Poultry chicken has no religious restrictions against their consumptions and its production helps in reducing the problems caused by food insecurity, poverty and un-ecological management of natural resources (Adedokun *et al.,* 2021). The production of poultry products has significantly increased in relation to demands for meat and eggs with global poultry output increasing from approximately 115 million tons in 2016 to around 136 million tons in 2023 (Sulaiman *et al.,* 2024).

Poultry feed is the single largest expenses accounting for between 65 and 70 percent of the total costs of production. This coupled with competition between human and animals for the available grains necessitates the use of cheaper sources of nutrients to meet the nutritional requirements of poultry and reduce feed cost (Yusuf *et al.,* 2024). Soybean meal has been the backbone of protein supplementation in poultry diets for a long time, however, this trend is changing because of competition between poultry and humans which reduces the supply and increases its price (Hussain, 2024). Sweet potato leaves are relatively high in protein content compared to other protein-rich forages. The crude protein content in the leaves ranged from 250 to 290 g/kg dry matter (DM) which makes it a suitable candidate to replace expensive conventional feeds in poultry nutrition (An, 2004; Melesse *et al.,* 2017). Melesse *et al.,* (2017) reported that supplementing up to 10% of broiler feeds with Sweet Potato Leaf Meal (SPLM) improved weight gain and carcass parameter, without detrimental effects on normal growth of organs.

Although there have been several studies on the use of non-conventional feed sources as replacement for conventional protein sources, however, there are scanty scientific studies on the use of Sweet Potato Leaf Meal as replacement for conventional protein sources, thereby necessitating this research. This study therefore was conceived to investigate the effects of Sweet Potato Leaf Meal partially replacing soya bean as dietary plant protein sources on the growth performance, carcass and internal organs characteristics of broiler chicken.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Research and Training Farm of the Federal College of Horticulture, Dadin-kowa, Gombe state. Dadin-kowa town is located between latitude 10°18ˈEast and longitude 11º31ˈNorth and at an altitude of 218 meters above sea level. The climate of Dadin-kowa is characterized by two well-defined seasons. The rainy season (May-October) and dry season (November-April), it has the mean annual rain fall of 760-1100mm and temperature range of 24-48°C, (Usman *et al.,* 2022).

One hundred and twenty-eight (128) unsexed (Agrited strain) finisher broiler chickens were randomly allotted to four experimental diets that were replicated four times of eight birds per replicate in a Completely Randomized Design (CRD). Feed and water were supplied *ad libitum* during the experimental period which lasted for 28 days. All routine management practices and necessary biosecurity measures were carried out.
Fresh, mature sweet potato leaves were harvested and washed to remove soil and other debris. The leaves were then spread thinly on clean drying racks in a sunny area and turned regularly to ensure even drying. The dried leaves were ground into a fine powder using a hammer mill to ensure even mixing with other feed ingredients.
Four experimental diets for finisher phase (20%CP) were formulated in which SPLM replaced soya bean at 0, 10, 20 and 30% coded as diets 1 (control), 2, 3 and 4 respectively as shown in Table 1. The finisher diets were fed for four (4) weeks.

Data on feed intake, weight gain, initial weights, final weights, feed conversion ratio and mortality were collected and recorded. These were also used to calculate daily feed intake, daily weight gain and feed conversion ratio (FCR).
At the end of the experimental period, 2 birds per replicate were randomly selected and fasted for 12 hours before slaughter. The live weight, weight of carcass, weights of internal organs and lengths of intestines were also measured using sensitive scale and meter rule. The live and carcass weights were used to calculate the dressing percentages, and the internal organs weights were expressed as a percentage of live weights.

Data Analysis
Data collected were subjected to Analysis of Variance techniques as outlined by Steel and Torrie, (1980) using the Statistical Software of Minitab, 17.3.1., (Minitab, 2014). Differences between treatment means were separated using Duncan's Multiple Range Test (DMRT).

Table 1: Percentage composition of experimental diets fed to the broiler chickens at the finisher phase (4-8 weeks)

	Diets			
Ingredients	**1 (control)**	**2**	**3**	**4**
Maize	40.10	40.10	40.10	40.10
Soya bean	39.20	35.28	31.36	27.44
SPLM	0.00	3.92	7.84	11.76
Wheat offal	15.00	15.00	15.00	15.00
Fish meal	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00
+Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
Crude protein (%)	22.00	21.00	21.00	20.00
Met. Energy (kcal. /kg)	3000.00	3000.00	2950.00	2950.00
Crude fibre (%)	5.76	5.96	6.01	6.16
Calcium (%)	1.35	1.37	1.38	1.40
Phosphorus (%)	0.72	0.72	0.71	0.71

+A bio-organics nutrient supplement containing Vit. A; 4000000 i.u,Vit. D3; 800000 i.u, Vit. E; 9200mg; Niacin 11000mg; Vit. B2 2000mg; Vit. B6, 1200mg; Vit. B12 6mg; Vit. K3 800mg; Pantothenic acid 3000mg; Biotin 24mg; Folic acid 300mg; Choline Chloride 120000mg; Cobalt 80mg; Copper 1200mg; Iodine 400mg; Iron 8000mg; Manganese 16000mg; Selenium 80mg; Zinc 12000mg; Anti-oxidant 500mg. SPLM = Sweet potato leaf meal; SPLM = Sweet potato leaf meal

RESULTS AND DISCUSSION
The percentage compositions of the experimental diets as shown in Table 1 indicated that the diets are adequate and meets the requirement of broiler chickens in the tropical environment (Kpomasse *et al.,* 2021; Edache *et al.*, 2021). The results of performance of finisher broiler chickens fed SPLM as partial replacement for soya bean is shown in Table 2. The results showed that final weights (1461.70 – 1866.40g; $P<0.05$) were significantly influenced by the treatment diets, diet 2 (10%) had the highest value while diet 4 was the lowest. Total weight gain

was also affected (323.34 – 703.34g; P<0.001) with diet 1 having the highest value and decreases as the levels of SPLM increases. Daily weight gain (23.10 – 50.24g; P<0.001) was affected, diet 1 had the highest values and decreases as SPLM inclusion increases, and FCR (4.79 – 2.39; P<0.05) was also influenced, the diet 1 (control) had the best FCR, then followed by diets 2 (10%) and 3 (20%) while diet 4 (30%) had the worst value. However, daily feed intake and total feed intake were not significantly affected by the dietary treatments. This result is disagreeing with findings by Melesse *et al.,* (2017) who also reported higher feed intake and FCR for the control diets. However, Oghenebrorhie and Job, (2021) reported that inclusion of SPLM did not affect feed intake and FCR because according to their findings, as the inclusion rate of the test ingredient increased, the FCR values were statistically similar compared to the control diet and that SPLM did not only affect their weight gain but also enhanced the feed intake.

The carcass characteristics of finisher broiler chickens fed SPLM as partial replacement for soya bean is presented in Table 3. The live weight of broiler birds slaughtered (1.49 - 1.65kg). The dietary levels of SPLM replacing soya bean have not affected the live weight of the finisher broiler chickens. Similarly, plucked weight, eviscerated weight, carcass weight and the dressing percentage (65.04 -70.44) were not significantly influenced by the dietary treatments. Results of internal organ characteristics were also not influenced by the dietary levels of SPLM, the lungs weight (0.41 - 0.56%), the heart weight (0.38 - 0.44%), the liver weight (1.74 - 1.92%) and the gizzard weight (2.54 -3.27%) did not differ among treatment groups. The carcass characteristics are in conformity with the standard for broiler as reported by Lakurbe *et al.,* (2019) who fed different dietary sources. Ramoso *et al.,* (2024) reported that broiler chicken supplemented with SPLM dietary compounds demonstrated higher dressed weight compared to the control groups.

The kidney weight (0.03% - 0.04%) and abdominal fat weight (0.94 - 1.52%) also did not differ across the dietary treatment. Likewise, the pancreas weights (0.12 - 0.19%), small intestine weight (4.15 - 5.02%) and spleen weight (0.11 - 0.14%) were also not influenced by the dietary levels of SPLM. The values obtained for small intestine length (180.50 -211.63cm), Large intestine lengths (7.88 -10.13cm), and large intestine weight (0.09 - 0.13%) were all not significantly influenced by the dietary levels of SPLM as partial replacement for soya bean.

Table 2: Performance of finisher broiler chicken fed SPLM as partial replacement for soya bean

	Diets				
Parameters	**1 (control)**	**2**	**3**	**4**	**SEM**
Initial weight (g)	1113.10	1191.10	1109.40	1138.30	27.36^{NS}
Final weight (g)	1816.40^{a}	1866.40^{a}	1591.90^{b}	1416.70^{b}	191.25*
Total weight (g)	703.34^{a}	675.27^{ab}	482.50^{b}	323.34^{c}	279.07***
Total feed intake (g)	1675.00	1795.80	1505.00	1495.60	69.29^{NS}
Daily feed intake (g)	119.65	128.28	107.50	106.83	4.95^{NS}
Daily weight gain (g)	50.24^{a}	48.24^{a}	34.46^{ab}	23.10^{b}	19.95***
FCR	2.39^{a}	2.71^{a}	3.18^{a}	4.79^{b}	1.09*
Mortality	0.00	0.00	0.00	0.00	-

[abc] Means bearing different superscripts within the same row differ*** (P<0.001), ** (P< 0.01), *(P<0.05), NS= Not significant; SEM= Standard error of means, SPLM = Sweet potato leaf meal

Table 3: Carcass and internal organ characteristics of finisher broiler chickens fed SPLM as partial replacement for soya bean

	Diets				
Parameters	**1 (control)**	**2**	**3**	**4**	**SEM**
Live weight (kg)	1.65	1.61	1.49	1.51	0.08^{NS}
Plucked weight (kg)	1.53	1.56	1.36	1.42	0.08^{NS}
Carcass weight (kg)	1.16	0.99	0.96	0.90	0.18^{NS}
Dressed %	70.44	66.52	65.04	65.79	13.11^{NS}
Gizzard weight (%)	2.54	3.06	3.10	3.27	0.40^{NS}
Heart weight (%)	0.44	0.38	0.41	0.41	0.16^{NS}
Liver weight (%)	1.74	1.92	1.91	1.79	0.13^{NS}
Pancreas weight (%)	0.15	0.19	0.16	0.12	0.07^{NS}
Lungs weight (%)	0.41	0.51	0.49	0.56	0.12^{NS}
Abdominal fat (%)	1.50	1.52	1.18	0.94	0.30^{NS}
Kidney weight (%)	0.04	0.03	0.04	0.04	0.01^{NS}

Spleen weight (%)	0.13	0.14	0.11	0.11	0.08^{NS}
Small Int. Weight (%)	4.15	4.74	4.96	5.02	0.42^{NS}
Small Int. Length (cm)	180.50	207.75	200.50	211.63	13.58^{NS}
Large Int. Weight (%)	0.09	0.11	0.09	0.13	0.10^{NS}
Large Int. Length (cm)	9.08	7.88	10.33	8.06	1.89^{NS}
Head weight (%)	2.93	2.98	3.04	3.00	0.46^{NS}
Legs weight (%)	4.22	4.75	4.57	4.88	0.83^{NS}

NS = Non significant, SEM = Standard Error of Mean, SPLM = Sweet potato leaf meal

CONCLUSION

The present study revealed that growth performance, carcass and relative internal organ weights of finisher broiler chicken were not adversely affected by sweet potato leaf meal partially replacing soya bean as vegetable proteins. Thus, it can be concluded that SPLM can be effectively used to replace up to 10% of costly soya bean in the diets of finisher broiler chicken without negative effect on performance, carcass and internal organ characteristics.

REFERENCES

Adedokun, O. O., Ewa, E. U., Eburuaja, A. S., Akinsola, K. L., Oketoobo, E. A., Ojewola, G. S., & Ahamefule, F. O. (2021). Anti-nutrients, Haematology, Serum Chemistry and Digestibility of Broiler Chickens Fed Graded Levels of Cassava Foliage Meal. *Nigerian Journal of Animal Science and Technology (NJAST)*, **4**(2): 76-85.

An, L. V. (2004). Sweet potato leaves for growing pigs: Biomass yield, digestion and nutritive value (No. 470).

Edache, J. A., Inyam, L., & Edache, S. E. (2021). Effects of Feeding Diets Containing Pearl Millet Supplemented with Enzyme on the Carcass and Haematological Values of Broiler Chicken. *Asian Journal of Advances in Agricultural Research*, **14**(4); 52-60.

Hussain, M. (2024). Comparative Nutritional Value of Leguminous Seeds for Poultry: A Comprehensive Review. *International Journal of Veterinary and Animal Science*, **1**(1); 1-10.

Kpomasse, C. C., Oke, O. E., Houndonougbo, F. M., & Tona, K. (2021). Broiler production challenges in the tropics: A review. *Veterinary Medicine and Science*, **7**(3); 831-842.

Lakurbe, O. A., Doma, U. D., Abubakar, M., Bello, K. M. & Garjila, Y.A. (2019). "Comparative performance and carcass characteristics of broiler chickens fed graded levels of sorghum and pearl millet." *Nigeria Agricultural Journal,* **50**(2): 87-91.

Melesse, A., Alemu, T., Banerjee, S., & Berihun, K. (2017). The effect of the partial substitution of roasted soybean seed with graded levels of sweet potato (Ipomoea batatas) leaf meal on growth performances and carcass components of broiler chickens. *Asian-Australasian Journal of Animal Sciences*, 1-7.

Minitab (2014). Statistical Software.V.17.3.1. Minitab Inc., State College, P.A.

Oghenebrorhie, O., & Job, A. O. (2021). Performance characteristics of broiler chickens fed sweet potato (Ipomoea batatas) leaf in the tropics. *Livestock Research for Rural Development*, **33**, 1.

Ramoso Jr, G. M., Ramoso, R. F., Cordova, S. M., & Rabadan, E. J. G. (2024). Optimizing Broiler Growth, Yield Performance, Meat Sensory, and Productivity through Novel Synergies of Dietary Sweet Potato Leaf Meal and Water-soluble Multi-herbal Extract.

Steel, R.G.D. & Torrie, J.H. (1980). Principles and procedures of statistics. A biometrical approach. 2nd edition. McGraw-Hill, New York.

Sulaiman, R., Sulaiman, Z., Jaafar, A. M., & Sabo, A. (2024). Performance, Haematological Indices and Organoleptic Properties of Broiler Chickens Fed Diet Containing Cinnamon (Cinnamomum cassia) as Feed Additive. *Nigerian Journal of Agriculture and Agricultural Technology*, **4**(3): 213-222.

Usman, D., Fatima, M., Nasiru, H. A., Madu, I., & Dauba, B. D. (2024). Performance and Carcass Characterisctics of Broiler Finisher Chicken Fed Different Cereal fibre Sources. *Nigerian Journal of Animal Production,* **51**: Retrieved from https://njap.org.ng/index.php/njap/article/view/6364

Yusuf, A. A., Agyo, B., Isah, A., & Diftuffe, M. (2024). Effects of Various Protein Seed Cakes as Replacement for Full Fat Soybean Meal on the Haematological Characteristics and Serum Biochemical Indices of Broiler Chicken. *Nigerian Journal of Animal Production*, 876-880.