



## CARCASS CHARACTERISTICS OF BROILER CHICKENS FED DIETARY LEVELS OF SWEET POTATO PEEL MEAL AS REPLACEMENT FOR MAIZE

<sup>1</sup>Auta, Y. I.\*, <sup>2</sup>Muhammad, A. S., <sup>2</sup>Sani, I. and <sup>2</sup>Jama'a, N. A.

<sup>1</sup>Nigerian Agricultural Quarantine Service Abuja/Northwest Zone, Kano State.

<sup>2</sup>Department of Animal Production, ATBU Bauchi

\*Corresponding Author's Email: yunusaibrahim35@gmail.com, GSM: 08032861664

### ABSTRACT

An experiment was carried out to evaluate the carcass quality and yield as well as organs characteristics of broiler chicken fed graded levels of potato peel meal (SPPM) as replacement for maize. Five diets were formulated in which SPPM replaced maize at 0, 25, 50, 75 and 100% levels designated as diets 1, 2, 3, 4 and 5 respectively for both starter (23%CP) and finisher (20%CP) phases. Two hundred and twenty five one week old broiler chicks were allotted to the five diets in four replicates of fifteen chick each in a completely randomized design (CRD). Feed and water were given *adlibitum* for a period of six weeks. The result revealed that, all carcass parameters including live weight (0.69-1.54kg), plucked weight (0.62-1.47kg), eviscerated weight (0.45-1.19kg), carcass weight (0.37-1.08kg) and dressing percentage (54.43-69.33%) were significantly ( $P<0.001$ ) affected by the dietary treatments. However, the results of internal organs characteristics expressed as percentage body weight indicated that abdominal fat (0.08-2.47%), caecum (0.91-1.81%) and small intestine (6.96-13.24%) were significantly ( $P<0.001$ ) affected by the dietary treatments. Similarly, head, liver, kidney and lungs were affected significantly ( $P<0.01$ ) by the dietary inclusion of SPPM with values ranging between 3.00-3.83, 2.12-2.85, 0.54-0.99 and 0.54-0.98% respectively. The result further showed that, legs (4.69-4.70%), gizzard (1.89-2.51%), spleen (0.10-0.45%) and large intestine (0.41-0.71%) were not significantly ( $P>0.05$ ) affected by the dietary treatment. It was therefore concluded that sweet potato peel meal can be a good substitute for maize at 25% level in the diets of broiler chickens without affecting the carcass yield and organs characteristics and was recommended for enhance growth rate of the birds.

**Keywords:** Carcass, Organs, Broiler, Chicken, Diets

### INTRODUCTION

Production of Poultry has now transformed into one of the main divisions of agriculture all over the world. Poultry industry is perhaps the quickest developing fragment in rural area and undoubtedly assumes a significant part in Nigerian economy. In many parts of the world, broiler production offers the most rapid and cost-effective means of making available high quality animal protein to man. In Europe and America for instance, poultry meat is favored over beef due to its higher protein and lower caloric content in addition to other favorable meat qualities that makes it the number one choice for fast food restaurants such as Mr. Biggs and Kentucky fried chickens, which are the worldwide household names in the food vending industry (Okoli, 2021). A major constraint to poultry production in developing countries is the scarcity and high cost of the components of rations (Mozafari *et al.*, 2013). The scarcity and high cost of cereal grains especially maize has necessitated the research into alternative energy sources for feeding poultry. Poultry is one of the livestock industries that offers the highest turnover and quicker returns on investment either in small, medium or large scale production (Agubosi *et al.*, 2021). Currently, many countries in the world, including Nigeria suffer severe shortage of feed materials especially energy and protein sources. The price of feed stuff rose



about 400% within the span of 20 years (Udedibia, 2003). With the current global economic recession coupled with the naira devaluation, commercial poultry production in Nigeria is facing a highly challenging time. This poses a great danger in the survival of the industry in the country as many farmers are already quitting the business (Aremu *et al.*, 2010).

## **MATERIALS AND METHODS**

### **Experimental Location**

The study was conducted at the Abubakar Tafawa Balewa University Teaching and Research Farm Bauchi between March and April, 2024. Bauchi town is located on Latitudes 10°22'N and 11°55'N and Longitudes 09°48'E and 10°10'E respectively (Anon., 2018). Bauchi State occupies a total land area of 49,119km<sup>2</sup> representing about 5.3% of Nigeria's land mass and is located between Latitudes 9°3' and 12°3' North and Longitudes 8°50' and 11°0' East (Anon., 2020). Bauchi State is bordered by seven states, Kano and Jigawa to the North, Taraba and Plateau to the South, Gombe and Yobe to the East and Kaduna to the West. Bauchi climate is characterized by a well-defined rainy season (June – October) and dry season (November – May). The total mean annual rainfall in the state is 700-900 mm for the Northern zone, 690-1031 mm for central zone and 900 – 1300 mm for the western zone (BASDP, 2023). The mean temperature ranges between 19.15°C. The highest temperature is observed in the months of March, April and May, while the lowest is in the months of January and December every year. Highest relative humidity of 99% is observed in August and the lowest of 57% in February (Anonymous, 1999).

### **Experimental Diets**

Five (5) diets were formulated for both starter (23%CP) and finisher (20%CP) phases (Tables 1 and 2) in which SPPM replaced maize at 0, 25, 50, 75 and 100% levels designated as diets 1, 2, 3, 4 and 5 respectively. Other ingredients used in the diets include, wheat offal, full fat soya beans (FFSB), fishmeal, bone meal, limestone, common salt, palm oil, lysine, methionine and mineral-vitamin premix. Percentage composition and calculated analysis of the experimental diets for starter and finisher phases are presented in Tables 1 and 2.

**Table 1:** Percentage Compositions of Starter Experimental Diets Containing Graded Level of Sweet Potato Peel Meal as Replacement for Maize (1– 3 weeks)

Ingredients	T <sub>1</sub> (0%)	T <sub>2</sub> (25%)	T <sub>3</sub> (50%)	T <sub>4</sub> (75%)	T <sub>5</sub> (100%)
Maize	45.00	33.75	22.50	11.25	0.00
SPPM	0.00	11.25	22.50	33.75	45.00
FFSB	36.50	36.50	36.50	36.50	36.50
Wheat offal	9.50	9.50	9.50	9.50	9.50
Fish meal	4.00	4.00	4.00	4.00	4.00
Palm oil	1.00	1.00	1.00	1.00	1.00
Limestone	1.50	1.50	1.50	1.50	1.50
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00

**Calculated Analysis**

Crude prot. (%)	23.00	23.00	23.00	23.00	23.00
Crude fibre (%)	3.73	5.67	7.59	9.53	11.46
ME (Kcal/kg)	2986.70	2891.02	2795.35	2799.67	2804.00

SPPM = Sweet Potato Peel Meal, FFSBM = Full Fat Soya Bean, ME = Metabolizable Energy.

**Table 2:** Percentages and Proximate Compositions of Finisher Diets Containing Graded Levels of Sweet Potato Peel Meal as Replacement for Mazie (3 – 6 weeks)

Ingredients	T <sub>1</sub> (0%)	T <sub>2</sub> (25%)	T <sub>3</sub> (50%)	T <sub>4</sub> (75%)	T <sub>5</sub> (100%)
Maize	51.20	38.40	25.60	12.80	0.00
SPPM	0.00	12.80	25.60	38.40	51.20
FFSB	25.60	25.60	25.60	25.60	25.60
Wheat offal	14.00	14.00	14.00	14.00	14.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Palm oil	1.00	1.00	1.00	1.00	1.00
Limestone	1.50	1.50	1.50	1.50	1.50
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00

**Calculated Analysis**

Crude prot. (%)	20.00	20.00	20.00	20.00	20.00
Crude fibre (%)	3.63	5.83	8.03	10.23	11.24
ME (Kcal/kg)	2868.10	2809.24	2800.38	2791.53	2782.67

SPPM = Sweet Potato Peel Meal, FFSBM = Full Fat Soya Bean, ME = Metabolizable Energy.

**Experimental Birds and their Management**

Two hundred and twenty-five (225) one week old broiler chicks were randomly allotted to the five diets in three replicates of 15 chicks each in a completely randomized design (CRD). Experimental feeds and water were given *ad libitum* and the feeding trial lasted for six weeks



(3 weeks of starter and finisher each). Initial weights of the birds were recorded before commencement of the feeding trial and body weight changes were recorded weekly.

### Data Collection

#### Carcass and organs parameters

The birds were weighed at the beginning and the end of the experiment. At the end of six weeks, three broiler birds were randomly selected from each replicate and prepared for carcass analysis. Live weights of the selected birds were taken before slaughter and thereafter, they were dressed to obtain data on carcass (live, plucked, eviscerated and carcass weights as well as dressing percentages), internal and other organs weights (heads, legs, gizzard, liver, kidney, spleen, heart, lungs, pancreas, caecum, abdominal fat, small and large intestines).

#### Data Analysis

All data collected were subjected to analysis of variance (ANOVA) using SPSS (2.0) and significantly different treatment means were separated using Duncan's Multiple Range Test (DMRT).

## RESULTS AND DISCUSSION

The carcass yield and organs characteristics parameters of broilers are presented in Tables 3 and 4. The results revealed that, all carcass parameters (0.69-1.54kg live weight, 0.62-1.47kg plucked weight, 0.45-1.19kg eviscerated weight, 0.37-1.08kg carcass weight and 54.43-69.33% dressing percentage) were significantly ( $P<0.001$ ) affected by the dietary treatments. This does not agree with the findings of Doma (2020) in a GNC based diet experiment but agrees with the reports of Kawu *et al.* (2019) who obtained significant difference in most of the carcass characteristics measured in a broiler chicken fed GNC and soya bean based diets. The values are lower than those reported by Kpanja *et al.* (2020) in diets containing graded levels of Irish Potato Peel Meal (IPPM) in broiler chickens' experiment. It also goes contrary to the findings of Abera *et al.* (2017) in the roasted soya bean seed with graded levels of sweet potato leaf meal feeding trials. However, the results of internal organs characteristics expressed as percentage body weight (Table 4) revealed that abdominal fat (0.08-2.47%), caecum (0.91-1.81%) and small intestine (6.96-13.24%) were significantly ( $P<0.001$ ) affected by the dietary treatments. Similarly, head, liver, kidney and lungs were affected significantly ( $P<0.01$ ) by the dietary inclusion of SPPM with values ranging between 3.00-3.83, 2.12-2.85, 0.54-0.99 and 0.54-0.98% respectively. However, legs (4.69-4.70%), gizzard (1.89-2.51%), spleen (0.10-0.45%) and large intestine (0.41-0.71%) were not significantly affected by the dietary treatment. These results were slightly lower than the reports of Abera *et al.* (2017) and Kpanja *et al.* (2020) who reported values for gizzard (2.69–3.02%), lungs (0.60–0.80%), liver (1.81–2.49%), heart (0.32–0.71%) and kidneys (0.28–0.59%) in a similar study.

**Table 3:** Carcass Yield of Broiler Chickens Fed Diets Containing Graded Levels of Sweet Potato Peel Meal

Parameters	T <sub>1</sub> (0%)	T <sub>2</sub> (25%)	T <sub>3</sub> (50%)	T <sub>4</sub> (75%)	T <sub>5</sub> (100%)	SEM
Live weight (kg)	1.54 <sup>a</sup>	1.37 <sup>a</sup>	0.81 <sup>b</sup>	0.88 <sup>b</sup>	0.69 <sup>b</sup>	0.07***
Plucked weight (kg)	1.47 <sup>a</sup>	1.28 <sup>a</sup>	0.70 <sup>b</sup>	0.80 <sup>b</sup>	0.62 <sup>b</sup>	0.06***
Eviscerated weight (kg)	1.19 <sup>a</sup>	1.01 <sup>a</sup>	0.50 <sup>b</sup>	0.63 <sup>b</sup>	0.43 <sup>b</sup>	0.06***
Carcass weight (kg)	1.08 <sup>a</sup>	0.90 <sup>a</sup>	0.44 <sup>b</sup>	0.55 <sup>b</sup>	0.37 <sup>b</sup>	0.06***
Dressing (%)	69.33 <sup>a</sup>	64.90 <sup>ab</sup>	54.58 <sup>b</sup>	62.45 <sup>ab</sup>	54.43 <sup>b</sup>	2.38***

a, b, c= Means within the same row bearing different superscripts differ significantly. \*\*\*= highly significant (P<0.001), \*= significant (P<0.05), SEM= Standard Error of the Mean, NS= Not Significant (P>0.05), SPPM=Sweet Potato Peel Meal.

**Table 4:** Organs Characteristics (% live weight) of Broiler Chickens Fed Dietary Levels of Sweet Potato Peel Meal

Parameters	T <sub>1</sub> (0%)	T <sub>2</sub> (25%)	T <sub>3</sub> (50%)	T <sub>4</sub> (75%)	T <sub>5</sub> (100%)	SEM
Head (%)	3.21 <sup>ab</sup>	3.00 <sup>b</sup>	3.83 <sup>a</sup>	3.75 <sup>ab</sup>	3.77 <sup>ab</sup>	0.21**
Legs (%)	4.70	4.52	4.71	5.19	4.69	0.25 <sup>NS</sup>
Abdominal fat (%)	2.47 <sup>a</sup>	1.53 <sup>ab</sup>	0.43 <sup>bc</sup>	0.53 <sup>bc</sup>	0.08 <sup>c</sup>	0.26***
Gizzard (%)	1.99	1.89	2.17	2.51	2.31	0.16 <sup>NS</sup>
Liver (%)	2.53 <sup>ab</sup>	2.12 <sup>b</sup>	2.54 <sup>ab</sup>	2.55 <sup>ab</sup>	2.85 <sup>a</sup>	0.14**
Kidney (%)	0.95 <sup>a</sup>	0.66 <sup>ab</sup>	0.54 <sup>b</sup>	0.77 <sup>ab</sup>	0.99 <sup>a</sup>	0.10**
Pancreas (%)	0.78	0.44	0.44	0.43	0.52	0.11 <sup>NS</sup>
Spleen (%)	0.45	0.11	0.20	0.17	0.10	0.10 <sup>NS</sup>
Lungs (%)	0.98 <sup>a</sup>	0.64 <sup>ab</sup>	0.65 <sup>ab</sup>	0.54 <sup>b</sup>	0.64 <sup>ab</sup>	0.10**
Heart (%)	0.83 <sup>a</sup>	0.50 <sup>b</sup>	0.51 <sup>b</sup>	0.52 <sup>b</sup>	0.54 <sup>b</sup>	0.09*
Caecum (%)	1.31 <sup>ab</sup>	0.91 <sup>b</sup>	1.19 <sup>ab</sup>	1.38 <sup>ab</sup>	1.81 <sup>a</sup>	0.16***
Small Intestine (%)	6.96 <sup>b</sup>	7.15 <sup>b</sup>	9.10 <sup>ab</sup>	10.23 <sup>ab</sup>	13.24 <sup>a</sup>	0.93***
Large Intestine (%)	0.66	0.41	0.48	0.65	0.71	0.11 <sup>NS</sup>

a, b, c= Means within the same row bearing different superscripts differ significantly. \*\*\*= highly significant (P<0.001), \*= significant (P<0.05), SEM= Standard Error of the Mean, NS= Not Significant (P>0.05), SPPM=Sweet Potato Peel Meal.

## CONCLUSION AND RECOMMENDATION

Based on the result of this study, it was therefore concluded that sweet potato peel meal can be a good substitute for conventional maize at 25% level in the diets of broiler chickens without compromising the carcass yield and organs characteristics and was recommended for improved growth rate of broilers in the study area.

## REFERENCES

- Aberra, M., Temesgen, A., Sandip, B. and Kefyalew, B (2017). The effect of the partial substitution of roasted soya bean seed with graded levels of sweet potato (*Ipomoea batatas*) leaf meal on growth performances and carcass components of broiler chickens. *Asian-Australas Journal of Animal Science*, 3(1): 1-7.
- Agubosi, O.C.P., Imudia, F.D. and Alagbe, J. O (2021). Evaluation of the Nutritive Value of Air-Dried and Sun-Dried Sweet Potato (*Ipomoea batatas*) Peels. *Texas Journal of Agriculture and Biological Sciences* 1(12): <https://zienjournals.com>
- Anon. (2018). Nigeria Latitude and Longitude Map. [www.https://mapsofworld.com/lat\\_long/nigeria-lat-long](http://www.https://mapsofworld.com/lat_long/nigeria-lat-long)
- Anon. (2020). Bauchi State Wikipedia <https://images.app.goo.gL/fGBWQZLsfgfEk7869>





- Anonymous, (1999). Weather records of meteorological station, Bauchi Airport Bauchi State.
- Aremu, A., Adama, T. Z., Shiawoya, E. L. and Ayanwale, B. A. (2010). Cost benefit ratio of varying levels of energy and protein diets under single versus double phase feeding. *In: Fastracking Animal Agriculture in a challenged economy Proceedings of the 35<sup>th</sup> Annual Conference of the Nigerian Society for Animal Production*. March 14<sup>th</sup> -17<sup>th</sup>, 2010. Edited by O.J. Babayemi, O.A. Abu and E.O. Ewuola. University of Ibadan, Nigeria. 288-291
- BSADP (2023) Bauchi State Agricultural Development Programme Annual Report.
- Doma, U. D. (2020). Growth Performance, carcass characteristics and financial benefit of broiler chickens fed dietary levels of maize milling waste as replacement for maize *Nigerian Journal of Animal Science and Technology*. **3**(2):1-10
- Kawu, Y. U., Doma, U. D., Abubakar, M., and Bello, K. M (2019). Carcass Characteristics, haematology and serum biochemistry of broiler chickens fed diets containing gayamba pearl millet (*Pennisetum glaucum 1*) as replacement for red sorghum. *Nigerian Journal of Animal Science and Technology*. **1**(2):23-36.
- Kpanja, E.J., Duru, S., Kotso, J.A. and Gonjoh, P. T (2020). Effect of diets containing graded levels of Irish Potato Peel Meal (IPPM) on carcass quality, haematological and blood biochemical profile of broiler chickens. *Nigeria Journal of Animal Science* **22**(3): 242-249
- Mozafari, O., Ghazi, S. and Moeini, M.M (2013). The Effects of Different Levels of Edible Potato (*Solanum tubresum*) Replacing Maize on performance, serum metabolite and immune system of Broiler Chicks *Iranian Journal of Applied Animal Science* **3**(3):583-588
- Okoli, I. C., Omede, A. A., Opara, M. C., Uchegbu, M. C. and Enemu, V. (2021). Biochemical, physical and performance Evaluations of some commercial broiler Rations produced in Nigeria; *Journal of Agriculture and social Research (JASR)*.
- Udedibie, A. (2003). In search of food. FUTO and nutritional challenge of Carnavalia Seed. 6th inaugural lecture of the Federal University of Technology Owerri Nigeria. Pp 47.