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ORGANOLEPTIC PROPERTIES, CARCASS CHARACTERISTICS AND INTERNAL ORGAN PROFILE OF FINISHER BROILERS FED SUNDRIED CASSAVA PEEL MEAL BLENDED WITH PALM OIL SLUDGE

[1]Ezeoke, Francisca Chinwendu; [2]Nwoye, Ifeanyi Innocent

[1]Department of Animal Science, Faculty of Agriculture, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Nigeria

[2]Department of Agricultural Economics & Extension, Faculty of Agriculture, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Nigeria

*Corresponding author

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ABSTRACT

The study was conducted to evaluate the effect of graded level of sundried cassava peel meal (CPM) blended with palm oil sludge (POS) on organoleptic qualities, carcass and internal organ characteristics of broiler chickens. A total of 150day old broiler chicks from Caskada Company were used for the study. The birds were fed graded levels of sundried cassava peel meal plus palm oil sludge (CPMPOS) (0, 2.5, 5.0, 7.5,10.0 kg) in partial replacement of maize for treatment 1 2, 3, 4 and 5 respectively. On day 56 of the experiment, two birds from each replicate was selected and starved for at least 12 hours, six birds per treatment that were closest to the mean were selected from each of the treatment, tagged and slaughtered then scalded in hot water of 55^{o}C for one minute and dressed to evaluate carcass characteristics, processed and boiled for organoleptic properties. Thirty panelists were chosen for the organoleptic test. Data were collected based on the information generated from the nine (9) point hedonic scale. The panelists evaluated the samples for colour, flavour, juciness, tenderness and general acceptability. The result showed that there is significant difference ($P< 0.05$) for tenderness and juiceness and no significant effect ($P> 0.05$) on the appearance, colour, overall acceptability and flavour. The results showed that there was significant difference ($P < 0.05$) in live weight, shank, wing, drumstick, head and abdominal fat. There were no significant effect ($P > 0.05$) in the values of the intestine, gall bladder and heart. Thus, CPMPOS can partially replace maize on

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broiler diets without any deleterious effect on the organoleptic, carcass and internal organs quality.

Keywords: Broilers, cassava peel meal, palm oil sludge, organoleptic, carcass and internal organs.

INTRODUCTION

Food scarcity is a plague in many developing countries of the world, including Nigeria where daily intake of animal protein per capital falls far below the normal intake as recommended by FAO (1986), is not in doubt. The past few years have witnessed a rapid growth in human population of developing countries including Nigeria with resultant increase in demand for protein of animal origin which is in short supply. Feed constitutes about 70 - 80% of the total cost in poultry production (Durunna *et al.*, 2005). The bulk of the feed cost arises from energy and protein concentrates such as maize, soybean, fish meal and groundnut cake. The increase in feed prices and the scarcity of grains and protein plant supplements are important constrains hampering livestock production sector in Nigeria and in many other countries. Therefore, reducing the production cost is the main objective of farmers to maximize their net revenue and produce animal products in large quantity. The agro industrial by-products (AIBs) can have a major influence on reducing the production cost and more livestock will be produced. Hence, the need to harness the potential of the numerous AIBs and the so-called wastes as part replacement for expensive ones have been advocated (Aletor, 1986). The overall purpose of using alternative feedstuffs in livestock diets is to reduce the cost while improving or at least not affecting carcass characteristics and meat quality (Obeidat *et al.*, 2009). To alleviate this situation, it has been realized that broiler production is the fastest and easiest route (Dipeolu *et al.*, 1996; Nworgu *et* al., 2000) since they are prolific, possess a high feed conversion ratio and are accepted by all, irrespective of religion. The focus in the livestock industry involving intensive production with an alternative feedstuffs; mostly those that can reduce production cost though compare favourably in quality to the conventional feedstuffs (not being deleterious to the animal's health). The most relevant option to arrest the present feed crisis of livestock industry is by-product utilization. The use of these alternative feedstuff in livestock feed production will cut down feed prices, thus, making them more affordable by livestock farmers (Larry, 1993). Cassava tuberous roots are composed of a peel which contain about 10-20% of the tuberous root. A study on nutritional status of cassava peel by Aderemi and Nworgu (2007) showed that the protein content of the peels was 5.35%, cellulose and hemicellulose content were 5.40% and 21.65% respectively. However, the increasing cost of these energy and protein concentrates due to competition between humans and animals has necessitated research into non-conventional feedstuffs such as agricultural waste and agro-industrial by-product so as to reduce feed cost

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(Okeudo *et al.,* 2005; Sese *et al.,* 2014).The most prominent by-products of plant origin in use today as enumerated by Bello(1984) are mainly of oil seed cake, or meals and brewing wastes. The main oil seeds used in farming systems in Nigeria include oil palm fruits, cotton seeds, sesame seeds, Bambara nuts, groundnuts, melon seeds, coconut, rubber seeds, soybeans and sun flower seeds. These can be served in their full-fat or partly expressed forms as both energy and protein sources for extensive and intensive poultry systems.

Oil palm (*Elaeis guineensis*) trees are grown in abundance in South-south rainforest zone of Nigeria. The oil palm tree is a versatile tree crop with almost all its parts being useful and of economic value. Due to its economic importance as a high yielding source of edible and industrial oils, the oil palm is grown as a plantation crop in most countries with high rainfall (minimum 1600mm/yr) in tropical climates. The oil palm bears its fruits in bunches varying in weight from 10 - 40kg. The individual fruit which weighs between 6 – 20g are made up of an outer skin (exocarp), a pulp (mesocarp) containing the palm oil in a fibrous matrix, a central nut consisting of a shell (endocarp) that protects the seed and the seed kernel which itself contains an oil, quite different from palm oil, resembling coconut oil (Bello., 1984). Oil palm processing yields large quantities of palm oil sludge (POS) a liquid colloidal discharge (residue) left from the clarification of the crude palm oil (CPO). It includes aqueous liquid, dirt, residual oil and suspended solids, mainly cellulosic material from the fruits. Usually, this by-product is discharged into ponds or farmlands leading to environmental pollution. Dry POS is high in ether extract (11.7%), ash (19.5%) and of medium crude protein content (12.5%). Its mineral content (0.8% Ca, 0.3% P, 2.5% K and 0.7% Mg) is good, thus making it a potentially cheap and convenient material for enhancement of physiochemical characteristics of cassava peel meal for poultry feeding. POS is non-toxic as no chemical is usually added during the palm oil extraction process. Therefore blending cassava peel meal and POS for poultry feeding will reduce or prevent the discharge of POS into the environment and limit environmental pollution. More importantly, utilization of this industrial waste will reduce the cost of feed, lower the aggregate cost of animal production, reduce the cost of animal products and increase demand and intake of animal proteins.

It is anticipated that blending cassava peel with POS will enhance physical characteristics of the final feed such as bulk density, particle size distribution, pellet characteristics and energy density. These will in turn improve feed intake and utilization by poultry. However, it is possible that inclusion of such a product at high levels in poultry diets may affect the composition and quality characteristics of broiler meat. The aim of this study is to determine the effect of cassava peel meal blended with palm oil sludge on carcass and internal organs of broilers chicken.

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MATERIALS AND METHODS

Project location

This experiment was carried out at the poultry unit of the Chukwuemeka Odumegwu Ojukwu University farm, Department Animal Science, Faculty of Agriculture Igbariam Campus. The area lies between 39° 25' 45.9" E longitude and 10° 35' 2.7" N latitude. The agro-climatic conditions of the area are moderate with an average altitude of 2730m above sea level and the annual rainfall ranges from 766.2 to 1250 mm which is usually inadequate (short), poorly distributed, and highly variable in inter and intra seasons with temperatures ranging from 19-30 0 C.

Source of test materials

Cassava peel and palm oil sludge that was used in the experiment were gotten from Igbariam town in Anambra East Local Government Area of Anambra State.

Experimental chicks and design

Total of one hundred and fifty (150) day old chicks were used for the experiment. The chicks were weighed on arrival and placed on treatment 1(0% inclusion of CPMPOS), treatment 2 (2.5kg CPMPOS), Treatment 3 (5kg CPMPOS), Treatment 4 (7.5kg CPMPOS) and Treatment 5 (10kg CPMPOS). The birds were randomly assigned to 3 replicate of 10 birds each in a Completely Randomized Design (CRD).

Carcass and organ evaluation

Two birds whose live weights were closest to the mean of each replicate were tagged and starved for 12 hours. Each bird was slaughtered by severing the jugular vein and allowed tobleed in a vertical position (head down). After bleeding, the birds were individually weighed and scalded in hot water, de-feathered and eviscerated. The carcasses were cut into parts according to the methods described by USDA (1998). The offal (the head, neck, breast, thigh, shank, wing, drumstick, back, abdominal fat) and organs (gizzard, intestine, liver, spleen, proventriculus, gall bladder and heart) were carefully separated and weighed. The weight of each part was expressed in percentage of the live weight of the bird. The live weights were expressed in kilogram.

Organoleptic properties

Meat preparation was done by moist cooking method. The meat samples weighing 30 – 35 g was cooked under steam for 30 minutes. The meat was served to 30 member trained sensory panel drawn from the 500 level students of the Department of Animal Science, Chukwuemeka Odumegwu Ojukwu University Igbariam Campus. The panellists evaluated the samples for

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colour, flavour, juiciness, tenderness and general acceptability; using a 9 (nine) point hedonic scale as described by Sanwo *et al*. (2011). The scores were arranged in a descending order, the maximum score 9 (nine) was given extremely like while 1(one) was for the poorest condition (extremely dislike).

Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) as outlined by Snedecor and Cochran (1970). Where significant differences are observed between treatments, means were compared using Duncan's New multiple Range test (DNMRT) as outlined by Obi (1990). The SPSS Statistics 23 application package was used in statistical analysis.

RESULTS AND DISCUSSION

Information on organoleptic of broiler fed CPMPOS supplemented diet is scare in literature. As shown in Table 1, appearance, color, overall sample and flavor showed no significant effect [P >0.05] on the experimental birds. Tenderness showed significant differences among the treatment groups. The treatment with 10kg of CPMPOS (T5) scored the highest value of 8.83, followed by control group (T1),and then the treatments 2, 3 and 4 were similarly affected with the following values 6.67, 7.33 and 7.33 respectively. There is significant difference (P> 0. 05) among the groups for juiciness. Birds fed 10kg of CPMPOS rated highest with 8.5 value, followed by treatment four (7.5kg of CPMPOS). Then, treatment 1 (0kg of CPMPOS) scored 7.6 while treatment 2 (2.5kg of CPMPOS) recorded 6.83 and lastly was treatment 3 (5kg of CPMPOS).Panelists preferred the flavor of treatment 5 (10kg of CPMPOS) most, compared with other treatments. This observation contradicts with the fact that high underlying fats deposited on the carcass increases its flavor because from the report on the carcass characteristics, treatment five scored least in terms of abdominal fat. Thus, fat (broth) concentration in meat during cooking is known to increase its flavor. The overall sample acceptability of the meat was rated highest in the treatment five (10kgCPMPOS) meat samples, scoring 8.5, followed by treatment 3 (5kgCPMPOS) with 7.5 and 7.33 for both treatment 2 (2.5kg CPMPOS) and treatments 4 (7.5kg CPMPOS). The 5^{th} treatment meat sample being rated highest among the treatment meats for overall, acceptability was expected, as it previously rated highest in flavor which is the most important factor for considering palatability or organoleptic traits of meat (Ikeme, 1990).

Table 1: Effect of processed cassava peel meal blended with palm oil sludge based diet the organoleptic properties of broiler meat

Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**SEM**
Appearance	6.83	7.83	8.00	8.17	8.17	0.204
Colour	6.83	7.00	7.67	7.83	8.50	0.275
Overall acceptability	6.67	7.33	7.50	7.33	8.50	0.339
Flavour	6.50	7.16	7.00	7.67	8.00	0.341
Tenderness	6.50^{b}	6.67^{ab}	7.33^{ab}	7.33^{ab}	8.83^{a}	0.329
Juiciness	7.60^{ab}	$6.83.^{bc}$	6.60^{c}	7.83^{ab}	8.50^{a}	0.212

^{a,b,c} means along the same rows with different superscripts are significant (PO.05)

SEM- Standard Error of means, Tl = 0.00 kg CPMPOS, T2 =2.50 kg CPMPOS, T3 = 5.00kg CPMPOS

T4 = 7.50 kg CPMPOS, T5 = 10.00 kg CPMPOS

Table 2: Effect of processed cassava peel meal mixed with palm oil sludge based diet on carcass characteristics of broilers chickens

Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**SEM**
Live weight(g)	2.09^{b}	2.28^{a}	2.25^{a}	2.10^{b}	2.10^{ab}	0.255
Carcass (%)	83.96	88.93	91.81	90.66	88.86	1.163
Dressed (%)	81.25	83.50	81.01	83.57	79.98	0.923
Breast(%)	24.49	24.68	26.25	23.20	23.77	0.535
Thigh(%)	18.89	19.21	16.56	20.31	18.65	0.411
Shank(%)	4.78^{b}	7.17^{a}	3.70^{b}	4.11^{b}	3.75^{b}	0.411
Neck(%)	4.81	3.94	3.84	3.97	4.06	0.181
Wing(%)	7.81^{ab}	7.88^{ab}	7.83^{ab}	9.04^{a}	7.66^{b}	0.198
Drumstick(%)	10.05^{ab}	10.21^{a}	9.16^{b}	10.15^{a}	9.69^{ab}	0.146
Head(%)	2.55^{ab}	2.77^{a}	2.21^{b}	2.86^{a}	2.66^{ab}	0.086
Back(%)	11.6	12.12	11.52	12.21	12.03	0.200
Abdominal fat(%)	0.97^{a}	0.43^{b}	0.29^{b}	0.47^{b}	0.06^{c}	0.084

^{a,b,c}, means along the same row with different superscripts are significant (P<0.05)

SEM- Standard error of mean. T1=0kg of CPMPOS, T2= 2.5kg of CPMPOS, T3= 5kg of CPMPOS, T4=7.5kg of CPMPOS & T5= 10kg of CPMPOS

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The result of the trial of the influence of sun-dried cassava peel meal mixed with palm oil sludge (CPMPOS) on carcass characteristics was shown on the Table 2 There were significant difference ($P<0.05$) on live weight, shank, wing, drumstick, head and abdominal fat, but no significant effect ($P>0.05$) on carcass weight, dressed weight, breast muscles, thigh, neck, back.

The live weight was significantly affected ($P<0.05$) among the treatment group. The treatment birds were observed to compare favourably with the control group. The diet 2 and 3 were similarly affected with higher values of 2.28kg and 2.25kg respectively, while control diet, diet 4 and 5 were similarly affected with 2.09kg, 2.10kg and 2.13kg values respectively. The abdominal fat in this study were significantly affected ($P<0.05$). The control group score the highest value of 0.97%, diets 2,3 and 4 were similarly affected and diet 5 was least affected. Drumstick also showed significant differences ($P<0.05$) with the treatment diet compared favourably with the control group. Diet 2 which contained 2.5kg of CPMPOS had the highest value of 10.21%, followed by diet 4. Control diet and diet 5 were similarly affected with 10.05% and 9.69% respectively where diet 2 of 5kg CPMPOS recorded the lowest value.

Table 3: Effect of processed cassava peel meal mixed with palm oil sludge based diet on the internal organ weights of broiler chicken

Parameters (%)	T1	T2	T3	T4	T5	SEM
Gizzard	1.74^{ab}	1.63^{ab}	1.85^{ab}	1.94^{a}	1.75^{ab}	0.042
Liver	2.07^{a}	1.78^{b}	1.91^{ab}	2.07^{a}	2.17^{a}	0.049
Spleen	0.43^{a}	0.056^{b}	0.10^{ab}	0.11^{ab}	0.06^{b}	0.056
Intestine	5.08	4.68	4.78	6.14	6.0	0.234
Proventriculus	0.35^{ab}	0.32^{ab}	0.26^{b}	0.43^{a}	0.28^{ab}	0.022
Gall bladder	0.13	0.12	0.16	0.08	0.08	0.017
Heart	1.40	0.35	0.36	0.36	0.35	0.190

^{a,b,c}, means along the same row with different superscripts are significant ($P<0.05$)
SEM- Standard error of mean

From the result shown in Table 3, there were significant difference ($P < 0.05$)in parameters like gizzard, liver, spleen and proventriculus. The treatment diets were highly affected favourably with the control group. Diet 4 (7.5kg CPMPOS) scored the highest percentage of 1.94% ($P<0.05$) while other diets and control groups were similarly affected. Liver also showed significant differences ($P<0.05$) among the treatment groups. The control group, diet 4 and 5 were highly affected ($P<0.05$) with the highest percentage value of 2.07%, 2.07% and 2.17% respectively.

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DISCUSSION

The sensory meat quality trait which constitute first basis for customers' perception is the color and flavor. Both color and flavor of the samples from boilers fed T1, T2, T3, T4 and T5 inclusion levels of CPMPOS had no significant differences among the dietary treatments as such this suggests that the addition of CPMPOS do not affect color and flavor of the broiler meat. A similar trend was reported by (Adetola, 2016) in term of color of broiler fed graded levels of extruded sesame seed meal. The samples for sensory quality traits of juiciness and tenderness had significant difference across the treatments. However, the significant differences across the dietary treatments for juiciness and tenderness had no effect on the panelists' overall acceptability of the meat sample (Owosibo *et al*, 2019). Thus, the meats from broiler fed 2.5kg CPMPOS, 5kg of CPMPOS, 7.5kg CPMPOS and 10kg CPMPOS inclusion levels were similarly acceptable by the panelists with above the threshold score value range of 6.67 to 8.50.

The inclusion of CPMPOS in the diet of broiler had a significant effect ($P<0.05$) on organs of the treatment birds. The increase in the weight of gizzard, liver and proventriculus supports the work of Agbola (2000) that improved feeding in terms of nutrition and health helps in weight in this study was similar to the findings of Okukpe (2019) and Addo (2002) on improved growth performance in animals fed bitter leaf meal.

The result of the trial with respect to the effect of sun-dried cassava peel meal mixed with palm oil sludge on the carcass characteristic of broiler meat were presented in Table 2. From the study it was observed that chickens fed dietary level of CPMPOS had the best live weight, shank, wing, drumstick and head compared to the control group. The live weight ranged from 9.16% to 10.21%. The improved live weight and drumstick of the treatment birds could be due to the high level of NFE of the test material and nutrient utilization by the host animal resulting to improvement in weight gain. The significant effect of CPMPOS treatment compare to control in live weight and drumstick is in line with the findings of Opoola, (2021) who reported significantly higher mean values of live weight and drumstick in probiotic (*Lacto acidophilus*) fed broilers. The results showed that birds fed 5kg, 7.5kg and 10kg CPMPOS showed significant reduction ($P<0.05$) on abdominal fat when compared with the control. This means that CPMPOS was able to reduce the abdominal fats and by implication lowering the cholesterol and triglyceride levels on the carcass of these broilers at different levels of inclusion. This result is in line with Amaduruonye *et al.*, (2017) whose work on ginger root meal showed the same decrease in abdominal fat with increased level of ginger root meal. Due to the health implications associated with the consumption of meats that are high in fat, cholesterol and triglycerides, it will be healthier, preferable and encouraging consuming meats produced from CPMPOS since these meats produced from CPMPOS contain less fat, cholesterol and triglycerides. The lowering of

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fat contents on the broiler carcass by CPMPOS may find useful application in improving the cardiovascular health in humans. CPMPOS can be effective and beneficial in regulating excess fat deposition, cholesterol and triglyceride levels in humans and animals.

CONCLUSION

From the study, it was shown that the method of processing cassava peel influenced to a large extent the organoleptic properties of broiler. Increase in the quantity of CPMPOS gave highest flavor and overall acceptability of meat. Meat processors, sellers and home consumers can apply findings from this study. The results of the present study showed that dietary inclusion of CPMPOS in broiler ration can compete favourably with maize diets to improve carcass characteristics and functional nutrient digestibility of broiler chickens without having any adverse effect on the organs characteristics. This is inferred that CPMPOS can be used effectively to regulate excessive fat deposition, triglyceride and cholesterol levels in humans and animals. Consumption of meat produced from CPMPOS will be preferable, encouraging and healthier due to the health implications on the consumption of meats that are high in fat, cholesterol and triglycerides. In conclusion, Cassava peel meal (sundried) mixed with palm oil sludge (CPMPOS) can be better used in partial replacement for maize up to 10kg inclusion in broiler diet for better carcass and internal organ traits without any adverse effect on the sensory attributes of the broiler meat.

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