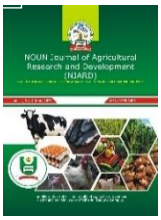
NOUN Jour. of Agric. Res. & Dev. Vol. 2, No.1, Page 133 - 142

p-ISSN: 1595-1405

NOUN Journal of Agricultural Research and Development (NJARD)

The Official Journal of the Faculty of Agricultural Sciences, National Open University of Nigeria, Kaduna Campus

Journal homepage: https://journal.agric.nou.edu.ng



Original Article

Influence of Flashed-Dried Cassava Pulp on Carcass Traits, Internal Organ Weights, cooking lost and Sensory Evaluation of Exotic Finishing Turkeys

OPEN ACCESS

Raji, M. O[1, 3.]., Abegunde, P. T[2, 3]., Adeniyi, O. A[1, 2]., Adesope, A. T[1]., Fasasi, M. O[3]., Ishola, O. J[3,4]., Asafa, A. R[4]., Onigemo, M. A[4]., Obasoyo, D. O [5]., Adeyeye, E. A[3]., Oso, A. O[3] & Bamgbose, A. M [3]

[1.] *Department of Animal Health and Production Technology, Oyo State College of Agriculture and Technology, P.M.B 10, Igboora*

[2.] *Department of Animal Health Technology, Oyo State College of Agriculture and Technology, P.M.B 10, Igboora*

[3.] *Department of Animal Nutrition, Federal University of Agriculture, P.M.B. 2240 Abeokuta, Nigeria*

[4.] *Department of Animal Production, Lagos State University of Science and Technology, Ikorodu, Lagos State, Nigeria*

[5.] *Department of Animal and Food Science, Ambrose Alli University, Ekpoma, Edo State, Nigeria*

***Correspondence Author**: papat4u@gmail.com,+2348052433781*

Editor: *Dr. Sunday N. Obasi*
National Open University of Nigeria

Received: *May 12, 2026*
Accepted: *July 01, 2026*
Published online: *June 25, 2026*
Peer-review: Externally peer-reviewed

Conflict of Interest: *The authors have no conflicts of interest to declare*

Financial Disclosure: *The authors declared that this study has received no financial support*

Abstract

Maize constitutes the major energy source in poultry diets, but high cost and competition with human consumption necessitate alternative feedstuffs. Flash-dried cassava pulp (FDCP) is an abundant agro-industrial by-product with potential as a maize replacer, yet data on its utilization in finisher turkeys are limited. This study was conducted to assess carcass traits, internal organ weights, cooking lost and sensory evaluation of exotic finisher turkeys fed graded levels of FDCP as partial replacement for maize. One hundred and twenty day-old British United Turkey (BUT) poults were brooded. Turkeys were transferred from the starter phase to the grower phase, where they had been already randomly allotted to four dietary treatments in a completely randomized design (CRD). FDCP replaced maize at 0%, 5%, 10%, and 15%. Each treatment had 30 birds and replicated six times with five birds per replicate. Feed and water were provided ad libitum for 96 days. At 16 weeks of age, one bird per replicate was selected, weighed, and slaughtered by cervical dislocation. Live weight, plucked weight, eviscerated weight, and weights of cut parts were recorded using a sensitive scale. Dressing percentage and relative weights of cuts parts were expressed as percentages of live weights. Varied inclusion levels of FDCP improved carcass characteristics, had no deleterious effect on internal organs weights of turkey finishers and sensory evaluation scores were also improved with FDCP inclusion. Conclusively, FDCP can be included up to 15% in finisher turkey diets as a replacement for maize without compromising physiological status or carcass quality. Therefore, 15% FDCP inclusion is recommended. Further studies are suggested to evaluate inclusion levels beyond 15% and to investigate the effect of other processing methods and enzyme supplementation on FDCP utilization in turkey nutrition.

Keywords: Turkey finishers, carcass evaluation, internal organ weights, sensory evaluation and flashed-dried cassava pulp

1.0 INTRODUCTION

Feed cost accounts for 70-80% of poultry production expenses, driven largely by maize as the primary energy source (Shaahu et al., 2017). Flash-drying is a rapid dehydration technique that reduces moisture and anti-nutritional factors in wet agro-by-products. Cassava pulp is the fibrous residue from starch extraction, containing high starch but prone to spoilage due to 75-80% moisture content (Khampaka et al., 2014). Carcass traits refer to dressing percentage and cut-part yields, internal organ weight reflect metabolic/physiological status; sensory evaluation assesses meat quality attributes of taste, aroma, texture and overall acceptability.

The rising cost and human-food competition for maize necessitate exploration of locally available, non-conventional energy sources for sustainable turkey production in Nigeria. Flash-dried cassava pulp (FDCP) is abundant and potentially cheap, but its rapid spoilage and variable nutrient composition limit use. Drying FDCP could improve storability and nutritional value, making it a viable maize replacer in finisher turkey diets where energy demand is high for carcass finish and meat quality. Thus assessing FDCP effect on carcass traits, organ weights and sensory attributes is essential for cost-effective and sustainable turkey meat production.

Previous studies in broilers reported that sun-dried cassava pulp can replace maize up to 8% without negative effects on serum enzymes and abdominal fat (Khempaka et al., 2009; Raji et al., 2020). However, data on FDCP in turkeys, especially Meleagris gallopavo at the finisher phase are scarce. Turkeys have different protein-energy requirements and fibre tolerance than broilers, and most studies stopped at ≤10% inclusion. Additionally, limited information exists on FDCP influence on carcass yield, relative internal organ weights and sensory evaluation of exotic finishing turkeys. This gap limits formulation of cost-effective turkey diets using FDCP.

Therefore, this study evaluated effect of graded FDCP on carcass traits, internal organ weight and sensory evaluation of exotic finisher turkeys. Carcass traits as indicator of meat yield and market value. Measured via live weight, dressed percentage and weights of primal cuts expressed as % live weight to determine if FDCP affects meat output. Internal organ weights show physiological adaptation and organ health. Measured via relative weights of liver, gizzard, kidney, heart to detect stress or metabolic load from FDCP anti-nutrients while sensory evaluation conceptualized as consumer acceptability of meat quality. It measured through panel scores for colour, aroma, tenderness, juiciness, and overall acceptability to assess marketability of meat from FDCP-fed turkeys. Thus, this study was needed to generate data on optimal FDCP inclusion levels in finisher turkey diets and provide a basis for reducing feed cost without compromising carcass quality or consumer acceptability.

2.0 METHODOLOGY

2.1 Experimental Site

The study was conducted at the Federal University of Agriculture, Abeokuta, Ogun, State, Nigeria, at the Poultry Unit of the Directorate of University Farms (DUFARM). The farm is located at an elevation of 415 feet and eye altitude of 700 feet, on Latitude $7^{o}13^{1}35.48''$ N and longitude 3^{0} 26^{1} 12.38''E respectively. The latter is at Latitude 7^{0} 13^{1} 57.53'' N., at an elevation of 1141 feet and longitude 3^{0} 26^{1} 12.38''E (Google Earth, 2020). The climate is humid with an average annual rainfall of 1,037 mm, a mean temperature and humidity of 43.7°C and 83%. It is situated in the rainforest vegetation zone.

2.2 Test Ingredient Procurement

Test ingredient used for this study was flash-dried cassava pulp (FDCP). Flashed-dried cassava pulp was obtained from the starch processing industry (Psaltry International Limited) along Maya, Ado-Awaye road, Iseyin Local government, Oyo State, Nigeria. Iseyin geographical coordinates are latitude 7^{0} 58' 0'' North and longitude 3^{0} 36' 0'' East.

2.3 Experimental Diets

Four iso-proteinous and iso-caloric diets were formulated in compliance with the NRC 1994 guideline. FDCP partially replaced maize at 0, 5, 10 and 15%. Gross composition of starter, grower and finisher diets are shown in Tables 1, 2 and 3 respectively.

Table 1: Gross composition (%) of experimental diets for starting turkeys (5– 8 weeks)

Ingredients (kg)	0%	5%	10%	15%
Maize	42.50	37.50	32.50	27.50
FDCP	0.00	5.00	10.00	15.00
Full fat soybean meal	13.50	15.00	16.50	18.00
Soybean meal	24.00	24.00	24.00	24.00
Wheat offal	7.80	6.30	4.80	3.30
Fish meal (72 %CP)	6.50	6.50	6.50	6.50
Lime stone	2.00	2.00	2.00	2.00
Bone meal	2.50	2.50	2.50	2.50
Lysine	0.20	0.20	0.20	0.20
Methionine	0.50	0.50	0.50	0.50
Vitamin/mineral Premix	0.25	0.25	0.25	0.25
NaCl	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated values				
ME (MJ/kg)	11.53	11.52	11.50	11.49
Crude protein (%)	26.12	26.08	26.05	26.02
Calcium (%)	2.04	2.04	2.04	2.04
Phosphorous (%)	0.78	0.77	0.77	0.76
Lysine (%)	1.33	1.31	1.28	1.25
Methionine (%)	0.87	0.85	0.84	0.82

** Vitamin/mineral premixes: Vitamin A – 13.340 iU., Vitamin E – 105 mg, Vitamin K3 – 3 mg, Vitamin B2 – 5 mg, Vitamin B6 – 4 mg, Ethoxyquin – 100 mg, Vitamin B1 – 3 mg, Vitamin D3 – 3,260 iU., Vitamin B12 – 0.04 mg, Niacinamide – 40 mg, Folic acid – 1.5 mg, Ca pantothenate – 12 mg, Biotin – 0.15 mg, Choline-Cl – 250 mg, Copper- 3.3 mg Zinc – 60 mg, Iron – 50 mg, manganese – 80 mg, iodine – 1 mg, and silicon – 0.25 mg* FDCP = Flash Dried Cassava Pulp ME = Metabolizable Energy NaCl = Sodium Chloride

2.4 Experimental Design and Turkeys' Management

One hundred and twenty (120) day-old British United Turkey (BUT) poults were sourced from a reputable farm in Nigeria and were brooded for twenty eight (28) days by using commercial pre-starter turkey. A standard deep litter system was used for the experiment (growing phase). Prior to the arrival of turkey poults, brooding pen, environment, facilities, equipment were thoroughly cleaned and properly disinfected. Brooding was done on deep litter pens, each pen (dimension 2.0m x 1.5m) containing 5 birds. Electricity and charcoal pots were the sources of heat. Birds were provided water and feed *ad libitum.* Vaccination and medication protocols were strictly followed. Management was firmly monitored to prevent build up pathogens. At the end of 28-day brooding period, turkey starters were randomly assigned into four (4) dietary treatments in a completely randomized design (CRD) and carried over to finishing phase. Thirty (30) growing turkeys were assigned per treatment and replicated six (6) times with five (5) growing turkeys per replicate.

2.5 Data Collections

2.5.1 Carcass Evaluation

At the 96th day, (finisher phase i.e 16th week), a turkey per replicate was selected, sacrificed by cervical dislocation, plucked and eviscerated. Parts such as head, crop and shank were removed and the carcass was eviscerated for the calculation of dressing percentage according to Oluyemi and Robberts (2002) procedure. Sensitive scale was used to know the weights of the live, plucked, eviscerated and cut parts and recorded accordingly. The weight dressed and other cuts parts were expressed as a percentage of live weight as follows:

Table 2: Gross composition (%) of experimental diets for growing turkey (9– 12 weeks)

Ingredients (kg)	0%	5%	10%	15%
Maize	52.00	47.00	42.00	37.00
FDCP	0.00	5.00	10.00	15.00
Full fat soybean	10.00	11.50	13..00	14.50
Soybean meal	20.00	20.00	20.00	20.00
Wheat offal	8.00	6.50	5.00	3.50
Fish meal (72 %CP)	4.50	4.50	4.50	4.50
Lime stone	2.00	2.00	2.00	2.00
Bone meal	2.30	2.30	2.30	2.30
Lysine	0.20	0.20	0.20	0.20
Methionine	0.50	0.50	0.50	0.50
Vitamin/mineral Premix	0.25	0.25	0.25	0.25
NaCl	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated values				
ME (MJ/kg)	11.96	11.87	11.77	11.68
Crude protein (kg)	22.55	22.42	22.28	22.15
Calcium (%)	1.84	1.84	1.84	1.84
Phosphorous (%)	0.67	0.67	0.66	0.66
Lysine (%)	1.56	1.13	1.08	1.04
Mthionine (%)	0.83	0.81	0.80	0.79

** Vitamin/mineral premixes - Vitamins A (10,000,000 iu), E (23,000 mg), B1 (1,800 mg), B2 (5,500 mg), and B2 (2,000,000 iu) Thyroxine 3, 5,500 mg, Pantothenic acid 7,500 mg, vitamin B6 3,000 (mg), vitamin B12 15 (mg), folic acid 750 (mg), chlorine chloride 300,000 (mg), selenium 200 (mg), cobalt 200 (mg), iodine 1,000 (mg), iron 20,000 (mg), niacin 27,500 (mg), manganese 40, 000 (mg), zinc 30,000 (mg), antioxidant KI, 250 (mg), and copper 3,000 (mg).* FDCP = Flash Dried Cassava Pulp; ME = Metabolizable Energy NaCl = Sodium chloride

Table 3: Gross composition (%) of experimental diets for finishing turkey (13– 16 weeks)

Ingredients (kg)	0%	5%	10%	15%
Maize	60.00	55.00	50.00	45.00
FDCP	0.00	5.00	10.00	15.00
Full fat soybean meal	8.00	9.50	11.00	12.50
Soybean meal	16.00	16.00	16.00	16.00
Wheat offal	8.00	6.50	5.00	3.50
Fish meal (72 %CP)	2.50	2.50	2.50	2.50
Lime stone	2.00	2.00	2.00	2.00
Bone meal	2.30	2.30	2.30	2.30
Lysine	0.20	2.00	0.20	0.20
Methionine	0.50	0.50	0.50	0.50
Vitamin/mineral Premix	0.25	0.25	0.25	0.25
NaCl	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated values				
ME (MJ/kg)	12.10	12.08	12.06	12.04
Crude protein (%)	19.36	19.23	19.10	19.00
Calcium (%)	1.71	1.71	1.71	1.72
Phosphorous (%)	0.59	0.59	0.59	0.58
Lysine (%)	0.98	0.95	0.92	0.90
Methionine (%)	0.78	0.77	0.76	0.74

**Vitamin/mineral premixes - Vitamin A 10,000,000 (iu), Vitamin D3 2,000,000 (iu), Vitamin E 23,000, Vit K3, Vitamin B2 5,500, Niacin 27,500, Vitamin B1 1,800, Pantothenic acid 7,500, Vitamin B6 3,000, vitamin B_{12} 15, copper 3,000, folic acid 750, biotin H_2 60, cobalt 200, iodine 1,000, iron 20,000, manganese 40, 000, selenium 200, zinc 30,000, antioxidant KI, 250 and chlorine chloride 300,000 (mg).* FDCP = Flash Dried Cassava Pulp; ME = Metabolizable Energy NaCl = Sodium chloride

$$\text{Dressed \%} = \frac{\text{Eviscerated weight x } 100}{\text{Live Weight}}$$

$$\text{Thigh percentge (\%)} = \frac{\text{Thigh weight x } 100}{\text{Live weight}}$$

$$\text{Drumstick percentge (\%)} = \frac{\text{Drumstick weight x } 100}{\text{Live weight}}$$

$$\text{Abdominal pad fat (\%)} = \frac{\text{Abdominal pad fat x 100}}{\text{Live weight}}$$

$$\text{Breast \%} = \frac{\text{Breast weight x } 100}{\text{Live Weight}}$$

$$\text{Wing \%} = \frac{\text{Wing weight x } 100}{\text{Live Weight}}$$

$$\text{Neck \%} = \frac{\text{Neck weight x } 100}{\text{Live Weight}}$$

$$\text{Head \%} = \frac{\text{Head weight x } 100}{\text{Live Weight}}$$

2.5.2 Internal Organ Weights:
Organs collected during carcass evaluation were cut into different part and weighed by using a sensitive scale. The parameters were weighed are the kidney, liver, spleen, bile duct, lungs, proventriculus, heart whole gizzard and empty gizzard.

$$\text{Organ \%} = \frac{\text{weight of organ x } 100}{\text{Live Weight}}$$

2.5.3 Sensory Evaluation

Seven panelists performed sensory analyzes of cooked turkey breast meat samples. 100g of the sample from each replicate's breast muscle was cleaned in clean water, placed in a clear polythene bag and labeled accordingly. Thereafter, meat samples were cooked at 70^0C for 30 minutes, cooled, and served accordingly to seven trained panelists that were used for sensory evaluation. Each panelist required to masticate one sample per replicate and awarded scores using Cross *et al.*, 1975 procedure (i= Dislike extremely, 2= Dislike very much, 3= Dislike moderately, 4= Dislike slightly, 5= Intermediate, 6= Like slightly, 7= Like moderately, 8= Like very much, and 9= Like extremely). Panelists members rinsed his or her mouth with water after assessing each meat sample to avoid carried over effects. Parameters evaluated by the panelists were colour, juiciness, favour, tenderness, and overall acceptability.

2.6 Statistical Analysis
Using SPSS (2021), a one-way analysis of variance (AOAC) was performed on all collected data. Duncan's multiple range test (Duncan, 1955) was used to differentiate significant ($p<0.05$) means between variables.

2.6.1 Statistical Models
$Yij = \mu+T_i+\mathcal{E}_{ij}$
where:
Yij = Observed value of dependent variable
μ = Population mean
Ti = Effect of treatment (0, 5, 10, 15%)
$\mathcal{E}_{ij}$ = Random residual error

3.0 RESULTS AND DISCUSSION

2.1 Results
Table 4 shows the results of the carcass qualities of finisher turkeys fed varying flash-dried cassava pulp. Experimental diets showed significant ($p<0.05$) effects on the final live weight, plucked weight, breast, wings, shank, eviscerated and dressed weight. However, variations in dressed percentage, head, thigh, drumstick, back and neck were not statistically similar ($p>0.05$). Plucked weight ranged between 8300.00g and 9000.00g, highest (9000.00g) was observed from turkey placed on 10% FDCP while the lowest (8300.00g) was obtained from both 0% FDCP and 15% FDCP. Eviscerated weight is between 7306.00g and 7981.00g. The highest (7981.00g) significant ($p<0.05$) effect was found from Turkey fed 5% FDCP while the lowest (7306.00g) was obtained from 15% FDCP. Breast was significant ($p<0.05$) between 27.24% and 36.08%, with the highest (36.08%) significant ($p<0.05$) value obtained from 15% FDCP while the lowest value (27.24%) was obtained from 10% FDCP. Wings revealed between 9.62% and 12.64%. Birds placed 0% FDCP showed the highest significant ($p<0.05$) wings (12.64%) while 10% FDCP revealed the lowest (9.62%) significance effect ($p<0.05$). The highest (4.30%) substantial effect ($p<0.05$) shank was obtained at 5% FDCP while 0% FDCP, 10% FDCP and 15% FDCP were statistically ($p>0.05$) equivalent and the lowest (3.00%) was recorded at T3 10% FDCP.

Table 4: Carcass evaluation of finisher turkeys fed experimental diets (0-16 weeks)

Parameters	0%	5%	10%	15%	SEM	P– value
Live weight (g)	9100.00^{b}	10000.00^{a}	9400.00^{b}	8900.00^{b}	142.22	0.006
Plucked weight (g)	8300.00^{c}	8600.00^{b}	9000.00^{a}	8300.00^{c}	90.03	0.000
EW(g)	7359.00^{c}	7981.00^{a}	7664.00^{b}	7306.00^{c}	82.36	0.000
Dressed weight (g)	7000.00^{bc}	7500.00^{a}	7300.00^{ab}	6900.00^{c}	85.61	0.016
Dressed (%)	80.87	79.81	81.53	82.09	0.45	0.347
Cut parts (% of LW)						
Head (%)	1.52	1.74	1.79	2.16	0.16	0.646
Breast (%)	34.60^{ab}	31.69^{b}	27.24^{c}	36.08^{a}	1.12	0.002
Thigh (%)	14.70	14.41	11.82	15.18	0.59	0.166
Drumstick (%)	13.06	14.04	11.44	13.47	0.54	0.409
Wings (%)	12.61^{a}	12.40^{a}	9.62^{b}	11.81^{a}	0.44	0.030
Back (%)	16.55	14.33	13.80	16.66	0.56	0.143
Neck (%)	3.57	4.66	3.18	3.86	0.25	0.193
Shank (%)	3.36	4.30	3.00	3.40	0.16	0.151

^{a,b,c}Means within the same row with different superscripts are significantly different (P<0.05). SEM= Standard error of the mean , EW= Eviscerated weight, % LW = Percentage live weight

Table 5 shows the results of internal organ weights of finisher turkeys fed flash-dried cassava pulp. Lungs, kidney, proventriculous, abdominal fat and whole intestine were significantly (p<0.05) influenced. However, heart, spleen, liver, empty gizzard and whole gizzard showed a non-significant (p>0.05) differences. The highest (0.53%) significant (p<0.05) effect on the lung was achieved with 0% FDCP, while 5% FDCP showed the lowest (0.33%) significant (p<0.05) effect. Turkeys fed 5% FDCP had highest 0.50% kidney while those on 15% FDCP had 0.37%. The highest (0.40%) significant (P<0.05) proventriculous was obtained in turkeys fed 15% FDCP) while least values (0.30%) were observed with 0% FDCP and 5% FDCP. Abdominal fat was between 0.00% and 0.77%, with the highest value (0.77%) found from turkey fed with 10% FDCP while 0% FDCP, 10% FDC and 15% FDCP were statistically comparable (p>0.05), turkeys placed on 0% FDCP shown the lowest value of 0.60%. Whole intestine ranged from 3.72% to 2.55%. The highest (3.72%) significant value (p<0.05) was noticed from 0% FDCP) while the lowest (2.55%) was obtained from T2 (5%FDCP).

Table 5: Internal organ weights of finisher turkeys fed experimental diets (0-16 weeks)

Parameters	0%	5%	10%	15%	SEM	P– value
Internal organ weights (% LW)						
Heart	0.13	0.46	0.47	0.72	0.11	0.294
Spleen	0.46	0.35	2.60	3.42	0.90	0.585
Lungs	0.53^{a}	0.33^{b}	0.40^{b}	0.41^{b}	0.02	0.006
Livers	1.36	1.32	1.57	1.34	0.10	0.850
Kidney	0.38	0.50	0.40	0.37	0.12	0.007
Proventriculous	0.20^{b}	0.20^{b}	0.25^{b}	0.40^{a}	0.03	0.005
Empty gizzard	1.86	1.86	1.68	1.81	0.88	0.910
Whole gizzard	2.66	2.50	2.27	2.74	0.16	0.786
Abdominal fats	0.60^{a}	0.00^{b}	0.77^{a}	0.68^{a}	0.10	0.001
Whole intestine	3.72^{a}	2.55^{b}	3.10^{ab}	2.92^{b}	0.16	0.036

$^{a, b}$Means within the same row with different superscripts are significantly different (P<0.05). SEM = Standard error of the mean % LW = Percentage live weight.

The results of cooking loss and organoleptic properties of finishing turkeys fed diets contained varying levels of flash-dried cassava pulp are shown in Table 6. A significant difference was observed in cooking weight ($p<0.05$) while initial weight, cooking loss percentage, colour, juiciness, meaty flavour, tenderness, saltiness, overall flavour and overall acceptability had no significant influence ($p>0.05$). Finishing turkeys fed 5% FDCP revealed higher (75.00 g) significant ($p<0.05$) cooked weight. A non-significant ($p>0.05$) effect was noticed from turkeys fed on the 0%, 5% and 15% FDCP, however, turkey finisher fed on 10% FDCP showed the smallest significant difference ($p<0.05$) of 70.00g. 10% and 15% FDCP were statistically comparable.

Table 6: Cooking loss and sensory evaluation of finisher turkeys fed experimental diets (0-16 weeks)

Parameters	0%	5%	10%	15%	SEM	P-value
Initial weight (g)	100.00	100.00	100.00	100.00	0.00	1.000
Cooked weight (g)	74.00[a]	75.00[a]	70.00[b]	73.00[ab]	0.74	0.044
Cooking loss (%)	26.00	25.00	30.00	27.00	0.62	0.052
Colour	6.86	6.86	6.14	5.29	0.37	0.411
Juiciness	6.57	6.86	6.86	5.43	0.43	0.614
Meaty flavor	6.71	6.57	5.86	5.71	0.34	0.681
Tenderness	6.00	7.29	6.43	5.57	0.42	0.536
Saltiness	5.29	4.86	5.57	5.14	0.40	0.942
Overall flavor	6.00	6.57	6.57	5.29	0.36	0.576
Overall acceptability	7.00	6.86	7.00	4.86	0.41	0.183

[a, b]Means within the same row with different superscripts are significantly different ($P<0.05$).
SEM = Standard error of the mean

3.2 Discussion

The carcass characteristics and organ weights of finishing turkeys from this research showed a non-significant difference on dressed percentage, head, thigh, drumstick, neck, heart, spleen, liver, kidney, empty gizzard and whole gizzard among the treatment groups. Since insufficient supplies of readily utilized amino acids can inhibit growth of tissues and organs, the comparable relative weights of these organs in the treatment groups suggested that these vital organs were performing their physiological activities to the best of their ability because they had adequate nutrients to support normal organs function and development (Alagawany *et al.*, 2020).

Finishing turkeys fed 5% FDCP diet had higher significant live weight than other treatment groups. Dressed weight followed a similar trend with live weight. The highest live weight observed from finishing turkeys fed varying levels of FDCP in this research considerably transformed into the greater average, plucked, eviscerated, and dressed weights, which can be attributed to the improved feed value due to processing as reported by Okomoda *et al.* (2017). Increased live weight at slaughter achieved with each treatment is consistent with the outcomes of Kingsley *et al.* (2022) who found that plant by-products increased birds' live weight. It was observed that the duration of flashed-dried cassava pulp in this study satisfactorily reduced the impact of metabolic inhibitors (anti-nutritional) and did not denatured proteins in the FDCP, therefore the experimental finishing turkeys excellently converting absorbed nutrients into body weights. The lower values of eviscerated and dressed weights at 0% could be as a result of aflatoxin in the control diet (maize), lower weight and carcass yield have been attributed to reduce crude protein (Olajide, 2017).

The proportion of breast and wings observed from turkeys fed FDCP diets did not differ when compared with the control except those finishing turkeys fed on 10% FDCP. The performance indices and tissue development are accurately reflected by the similarity on these carcass parameters between the FDCP and control diets. This indicates that FDCP diets provided adequate nutrients and

resulted in similar carcass parameters, this finding corroborated with the report of Makinde and Inuwa, (2015) and Sugiharto *et al.* (2019), who obtained similar observations when finishing turkeys and broilers respectively were placed on fermented cassava pulp diets. The significant higher differences observed from lung of control turkeys showed that lungs of finisher turkeys performed extra workload imposed by stress arisen during gaseous exchanging by the lungs while those on FDCP displaced normal work, hence, this suggests that FDCP diets were not detrimental to the organs. The higher significant proventriculus obtained from the finishing turkeys fed FDCP is in agreement with the findings of Awodola *et al.* (2015), who noted notable variations in broiler proventriculus weights.

Finishing turkeys on 5% FDCP had no abdominal fat while those on 10% and 15% FDCP produced fat and were favourably compared with finisher turkeys on 0% FDCP diet. This showed that feeding FDCP improved the carcass value of finishing turkeys, as indicated by similar abdominal fat weight. This is due to the capability of fibre to bind the bile salts produced from cholesterol and thereby reduce the deposition of fat in the abdomen of turkeys. The similarity abdominal fat observed from turkeys fed 0% FDCP, 10% FDCP and 15% FDCP diets from this finding showed the efficiency of the turkeys in converting carbohydrates in the feed to fat, this is in accordance with findings of Sugiharto *et al.* (2020), who observed similar abdominal fat when feeding broilers with fermented mixture of cassava pulp and moringa oleifera leaf meal. Length of Intestines found in this finding contradicts report of Oyewole *et al.* (2020), who reported a non-significant intestinal length when broiler chickens fed with cassava pulp as a substitute for maize. Therefore, identical carcass and organ development is attainable by partially replaced FDCP with maize in the turkeys' diet.

The weight loss value achieved by cooking in this study is aligned with the reports of Gohar *et al.* (2012) who assessed cooking loss of the broiler and layer meat and concluded that it ranged from 15.55 to 36.00%. The increase in cooking weight losses with increasing FDCP levels noted in this investigation corroborated with the report of Egbeyale *et al.* (2020) who evaluated cold water neem leaf (*Azadirachita indica*) extract on meat quality of broiler chickens and reported an increasing in cooking loss of the meat as neem leaf extract content increased, resulting in drier meat. Moreover, high cooking loss implies that the meat is able to retain less water during processing and storage (Abu *et al.*, 2015). According to Michalezuk *et al.* (2014), high cooking meat loss has an adverse effect on sensory perception because it reduces juiciness. A non-significant effect on sensory properties observed in this result showed that FDCP has no negative effect in meat sensory evaluation of the finishing turkeys' as subjectively assessed by the taste panelist participant.

4.1 CONCLUSION

The following conclusions were drawn:

i. Carcass traits: Dietary inclusion of flash-dried cassava pulp up to 15% improved carcass characteristics of exotic finisher turkeys. Birds fed 15% FDCP recorded significantly higher dressing percentage compared to the control, indicating that FDCP can replace maize without reducing carcass yield.

ii. Internal organ weights: Flash-dried cassava pulp inclusion had no deleterious effect on relative weights of internal organs. Liver, spleen, gizzard, heart, and kidney weights were comparable across all dietary treatments, suggesting that FDCP at up to 15% did not induce organ stress or abnormalities.
iii. Sensory evaluation / Meat quality: Sensory scores for colour, aroma, tenderness, juiciness, flavour, and overall acceptability of meat from FDCP-fed turkeys were similar to the control. This shows that FDCP inclusion up to 15% did not negatively affect meat quality and is acceptable to consumers. Flash-dried cassava pulp can replace maize up to 15% in finisher turkey diets to enhance carcass yield while maintaining internal organ health and acceptable meat quality.

4.2 RECOMMENDATION

Further research is recommended to investigate FDCP inclusion levels beyond 15% and the effect of enzyme supplementation or other processing methods on nutrient utilization and performance of turkeys.

Acknowledgement

The authors are grateful for the research support (flashed-dried cassava pulp) received from starch processing industry (Psaltry International Limited) along Maya, Ado-Awaye road, Iseyin Local government, Oyo State, Nigeria. Iseyin and

Directorate of University Farms (DUFARM), Federal University of Agriculture, Abeokuta, Ogun, State, Nigeria.

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