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Potentials of Avocado Pear Seed Meal as Replacement for Maize in the Diets of Starter Local Turkeys

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Abstract

This study, which aimed at using processed avocado pear seed meal as replacement for maize in the diet of local starter turkeys, assigned a total of 200 starter local turkeys randomly to 5 treatment diets in which avocado pear seed meal replaced maize at 0%, 7.5%, 15%, 22.5%, and 30% in a completely randomized design. Each treatment group was made of four replicates, ten poults per replicate. Proximate composition showed that avocado pear seed meal has 89% dry matter, 17.05% crude protein, 8.60% EE, and 5.80% crude fiber, while the metabolizable energy was 3279 kcal/kg. The phytochemical compounds in the processed avocado pear seed meal were 0.73 mg saponins, 0.01 mg tannins, 0.04 mg flavonoids, 0.34 mg oxalate, 0.13 mg alkaloids and 0.94 mg phytate. There were no significant differences ($p > .05$) in all the growth parameters examined. Results of carcass yield and cut-parts of starter local turkeys showed no significant differences ($p > .05$) among the parameters examined except the wing. There were significant differences ($p < .05$) in all the organ parameters evaluated. The total viscera of turkey poults on diet 5 were significantly higher ($p < .05$) than those fed control diet but similar ($p > .05$) to diets 2, 3 and 4 whereas diet 1 had the least value (10.59 g).The cost of production of turkeys fed diet 1 was significant higher ($p < .05$) than turkeys on diets 5 but similar ($p > .05$) to other groups, while turkeys on diet 5 had the least value. From these findings, diets containing processed avocado pear seed meal can replace maize in the diets of local turkeys.

Keywords: Carcass yield, feed–cost benefit, internal organ, performance, phytochemicals

What is already known?

- *Previous studies in broilers and Japanese quail have demonstfrated that low-level inclusion of avocado or African pear meal can support growth performance, without deleterious effects (Harahap et al., 2019; Agbalaya et al., 2023). However, high replacement levels (above 15-30%) have been associated with depressed growth and altered serum biochemistry, likely due to ant-nutritional factors such as tannins and oxalates (George et al., 2020).*

What does this study add to this topic?

- *Despite these findings in other poultry species, there is a lack of empirical evidence on the responses of starter local turkeys to avocado pear seed meal, since local turkeys are hardy, larger than broilers and*

Introduction

The cost of feeds and feedstuffs with adequate nutrient profiles for local turkey genetic improvement remains the major problems of local turkey production in the tropics (Oyediji et al., 2015). The starter phase is of great concern due to the huge nutrient requirements, particularly the energy and protein ratios to improve the rapid growth and physio-genetic improvements in the diets (Okoroafor et al., 2020). These drive local turkey farmers to seek affordable and least-cost alternative feed materials (Kumar et al., 2025). Maize is commonly used as a major energy source because of its high metabolizable energy potential. However, the post-COVID-19 era and current security challenges in the northern part of Nigeria, where maize is predominantly cultivated, have not only made maize unavailable but costly for the reach of local farmers who depend on the local turkeys as a source of income and means of livelihood, amidst other human, livestock, and industrial uses. These have heightened the need for the exploration of unconventional but sustainable feed resources (Saleh et al., 2026).

Agro-industrial and fruit processing wastes have come to lead in this search due to their abundance, low cost, and competing nutrient profiles (Kumar et al., 2025). Using them also solves the problem of greenhouse gas emissions from the biodegradable fraction, which could cause environmental pollution (Eze et al., 2025a).

Avocado peer (*Persea americana*) seeds have considerable potential for maize replacement due to their valuable biomass. They are proved to contain nutrients as an energy source and chiefly contribute to the presence of other nutrients and minerals in poultry nutrition (Bangar et al., 2022). However, avocado pear seeds are also characterized by some anti-nutritional factors such as tannin, saponin, phytate, oxalate, and non-starch polysaccharides (Dhull et al., 2020) which inhibit utilization by poultry birds, and these could be reduced or eliminated through processing.

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Japanese quail and tolerant to different nutrient variable. Therefore, the present study advanced the use of avocado pear seed meal in other poultry species other than quail and broilers. It also used the feed material as replacement for maize instead of mere additives. It further increased the inclusion levels above those in other poultry species.

Although there is little available scientific information on the use and dietary inclusion levels of avocado seed meal on growth performance, serum biochemistry, and meat quality in quail and broiler chickens (Falowo et al., 2025; Nyikadzino & Mnisi, 2025), such information was not obtained from studies conducted with turkeys, especially at the critical stage of poults where nutrient requirements are paramount for optimum growth responses from the diets.

Since there is limited empirical evidence on the replacement of maize with avocado pear seed meal (APSM) relative to growth performance and feed utilization in starter turkey poults, it is imperative to fill the research gap by evaluating the potential of APSM as a maize replacement.

Materials and Methods

Ethical Statement

All experimental procedures involving animals were conducted in accordance with the guidelines for the care and use of agricultural animals in research and teaching (FASS, 2010) and were approved by the Institutional Animal Care and Use Committee of National Veterinary Research Institute, Vom, Nigeria (nvriAUCC F001/15) , which was captured in the Constitution of the Federal Republic of Nigeria, Code Act. Cap C38 LFN 2004, Animal Disease (Control) Act. Cap A17 LFN 2004 as well as the Ethical Committee and the Research Directorate at Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria,with reference number: MOUAU//2024/1195, approved on November 30, 2024. The study also complies with the ARRIVE (Animal Research: Reporting of In Vivo Experiments) guidelines.

Type of Sampling and Rationale

Data were randomly collected for performance, carcass, and cost analysis parameters sampling for the investigation. This is chosen to show reflection of the treatments and changes in the performance, carcass, and cost analysis characteristics of starter local turkeys.

Criteria for Inclusion and Exclusion

Inclusion criteria: All experimental groups and respective replicates were included in the analysis by randomization. Data on feed, weight gain, and meat were taken from every replicate and treatment group for final weight, weight gain, feed intake, feed conversion ratio, and cost. Additionally, carcass samples which were collected were used for dress weight and other organ proportion determinations.

Exclusion criteria: The study excluded no animals in this study. All the starter local turkeys were included in the randomization and sample collection of the tested parameters. Any exclusion criteria could have altered the accuracy of the analysis.

Location of Study

The empirical study was carried out at the Poultry Unit of Teaching and Research Farm of Department of Animal Nutrition and Forage Science, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Umudike lies between latitude 5°-29' North and longitude 7°-33' East, and at an altitude of 123 m above sea level. It is ecologically situated in the rainforest zone of South Eastern Nigeria with an annual mean rainfall of 2177 mm, maximum temperature range of 22°C–36°C during the hot dry season of the year (November-April) and minimum temperature range of20°C–26°C during the total rainy season (May-September). The relative humidity ranges from 50% to 95% (NRCRI, 2020).

Experimental Poults, Management, and Design

A total of two hundred (200) local turkey poults (initial weight: 51.34 ± 0.24) were housed, brooded, and acclimatized for 7 days during which they were fed a control diet. They were later distributed among five experimental diets at the rate of 40 poults each and ten poults in each of four replicates, respectively, in a completely randomized design. The local turkey poults were given feed and water *ad libitum* for 56 days, between February and March 2025.

The poults were managed in uniform medication, environment, and climatic conditions. They had feed and water ad libitum using troughs appropriate for feeding and drinking. Newcastle disease vaccine (NDV) was administered i/o to poults on day one to avert early infection of NDV. Newcastle disease vaccine (Lasota) was administered orally at seven days, again, and the final dose was given at 21 days of age. Anti-coccidiosis was given orally between 14 and 17 days of age. Fowl pox vaccine was administered orally at seven weeks of age. Antibiotics and anti-stress drugs were applied at extreme environmental temperatures above 36℃. The vaccines were produced at the National Veterinary Research Institute in Vom, Plateau State, Nigeria, established in 1924. A foot-dip of disinfectant and water mixture was provided at the poultry house entrance for biosecurity measures. Source of light (electric bulbs)

was provided for illumination, especially at night. Cross ventilation was ensured using aerated wire gauze in the turkey pen.

Collection of Test Material and Processing
Matured avocado pear seeds were collected from Crop Research Institute Quarter, Umudike, Abia State, during the fruiting season of the year

(February–July). The processing methods used in this study involved: seeds being washed to remove the debris, sliced into smaller pieces of about 3.5–5.5 cm in diameter with the help of manual sharp knife, then 16 kg of sliced APSM was soaked in clean water of 8 liters in a 20-liter container for 24 hours at room temperature and sun-dried under intensive sun for three days. The sun-dried avocado seeds were milled using a machine grinder and the avocado seed meal was used for the proximate and anti-nutrient analysis. However, in the raw ground method of processing, the avocado seeds were only sliced into smaller pieces with the help of manual sharp knife and sun-dried for three days. The sun-dried seeds were then milled using a machine grinder and the avocado seed meal was used for the proximate and anti-nutrient analysis.

Proximate and Anti-nutrient Analysis
The proximate and anti-nutritional factors analysis of the test ingredients was carried out at the Nutrition and Biochemistry Laboratory of College of Animal Science and Animal Production of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Samples were analyzed chemically according to the official methods of analysis described by AOAC (2023), which were dry matter, protein, ether extract, moisture, ash, and fiber as shown in Table 1. All analyses were carried out in triplicate. The crude protein (CP) in the sample was determined using the routine Kjeldahl procedure. This consists of digestion, distillation, and titration. Crude fat or ether extract was carried out by Soxtec System using petroleum ether. Ash was determined by burning in a muffle furnace at 550°C for ten hours. The metabolizable energy (cal/kg) was calculated according to AAFCO (1997), using the formula: ME (kcal/kg) = (3.5 × CP + 3.5 × NFE + 8.5 × crude fiber (CF)) × 10. Whereas NFE = 100 − (Moisture + CP + EE + CF + Ash). Determination of anti-nutritional factors in avocado seed meal such as tannin, saponin, flavonoids, oxalate, alkaloids, and phytate was carried out according to Maga (1982) as shown in Table 2.

Experimental Diets
Five experimental diets were formulated based on the recommendation of N.R.C. (1994) for nutrient requirements of starter turkey as seen Table 3. The experimental diets were made of maize, soybean meal, avocado seed meal, palm kernel cake, fishmeal, bone meal, vitamin and mineral premix, salt, lysine, and methionine. The APSM replaced maize at 0%, 7.5%, 15%, 22.5%, and 30% respectively. The APSM in the diet increased with decreasing maize concentration, while other ingredients were similar in all the diets. The diet with zero level of APSM served as the control diet.

Data Collection
Physiochemical characteristics of avocado pear seed meal: Chemical composition of dietary ingredients and proximate composition of the experimental diets were carried out according to AOAC (2023), procedure. Determination of anti-nutritional factors in avocado seed meal such as tannin, saponin, phytate, oxalate, and alkaloids were carried out according to Maga (1982).

Table 1.
Proximate Composition of Major Feed Ingredients (% Dry Matter)

Parameters	PAPSM	RAPSM
Dry matter (%)	89.00	88.60
Crude protein (%)	17.05	14.80
Ether extract (%)	8.60	8.20
Crude fiber (%)	5.80	5.90
Ash (%)	1.80	2.70
Nitrogen-free extract (%)	55.75	57.00
Metabolizable energy (cal/kg)	3279	3210

Note: PAPSM = Processed avocado pear seed meal; RAPSM = Raw avocado pear seed meal.

Performance characteristics: Initial live weight of poults was obtained. Then the weekly weight was taken to determine the final weight and daily weight gain. Also, daily feed intake and FCR were calculated. The weighing was done without fasting since feed and water were provided *ad libitum*.

Carcass yield and internal organ proportions: After eight weeks of the feeding trial, three turkeys from each replicate were randomly chosen. Their dressed weights were measured, and the dressing percentage was calculated. The proportions of carcass cut-up parts and internal organs were determined.

Feed-cost benefit: The feed-cost benefit parameters were calculated at eight weeks of age for turkeys to assess the experiment's profitability. The cost of diets was calculated by adding the expense of each feedstuff used to make up the 25 kg of each diet, then converted to US dollars per gram of diet. The cost of producing turkeys was determined by averaging the feed intake cost per turkey over the entire production period, while the cost per kg of feed was found by multiplying the proportion of each ingredient in the diet by the cost of each 100. Additionally, the cost per weight gain was calculated by dividing the total production cost by the weight gain.

Statistical Analysis
Statistical analysis using Statistical Package for the Social Sciences SPSS, 2009 25.0 (SPSS Inc.; Chicago, IL, USA) was employed to analyze the data generated from the study. Data obtained were subjected to

Table 2.
Anti-Nutrient Constituents of Avocado Seed Meal

Parameters	PAPSM (mg/100 g)	RAPSM (mg/100 g)
Saponins	0.73	0.89
Tannins	0.01	0.03
Flavonoids	0.04	0.I0
Oxalate	0.34	0.39
Alkaloids	0.13	0.20
Phytate	0.94	1.28

Note: PAPSM = Processed avocado pear seed meal; RAPSM = Raw avocado pear seed meal.

Table 3.
Percentage Composition of Experimental Diets — Turkey Starter Ration

Ingredients	T_1 (0%)	T_2 (7.5%)	T_3 (15%)	T_4 (22.5%)	T_5 (30%)
Yellow maize	36.00	33.30	30.60	27.90	25.20
Avocado pear seed meal	00.00	2.70	5.40	8.10	10.80
Soybean meal (full fat)	48.00	48.00	48.00	48.00	48.00
Palm kernel cake	7.00	7.00	7.00	7.00	7.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Bone meal	3.00	3.0	3.00	3.00	3.00
*Vitamin premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Analyzed composition					
Crude protein (%)	28.64	28.82	28.99	29.17	29.37
Ether extract (%)	4.77	4.89	5.01	5.14	5.26
Crude fiber (%)	4.73	4.83	4.94	5.04	5.14
ME (Kcal/kg)	2855.45	2931.45	2968.95	2933.15	3044.10
Calcium (%)	1.47	1.49	1.51	1.54	1.56
Phosphorus (%)	0.90	0.90	0.90	0.91	0.91
Methionine (%)	0.72	0.71	0.70	0.71	0.71
Lysine (%)	1.56	1.56	1.55	1.55	1.56

*Vitamin/mineral premix (2.5 kg) contains Vitamin A (5000.000 I.U), Vitamin D3 (1000.000 I.U), Vitamin E (16,000 mg), Vitamin K3 (800 mg), Vitamin BI (1200 mg) Vitamin B2 (22,000 gm), Niacin (22,000 mg), Calcium pantothenate (4600 mg), Vitamin B6 (2000 mg) Vitamin B12 (10 mg) Folic acid (400 mg), Biotin (32 mg) Choline chloride (200,000 mg), Manganese (948,000 mg), Iron (40,000 mg), Zinc (32,000 mg), Copper (3400 mg) Lodine (600 mg), Cobalt (120 mg), Selenium (48 mg) and antioxidant (48,000 mg).
Note: ME = Metabolizable energy.

analysis of variance in a completely randomized design. The treatment means were separated using the New Duncan Multiple Range Test (Duncan, 1955). Analysis of covariance (ANCOVA) was further used to show covariate and interaction effects of initial body weight of poults and final body weight, weight gain, and feed conversion ratio.

Results

The phytochemical contents of avocado pear seed meal are presented in Table 2. The phytochemical compounds in the processed avocado pear seed meal (PAPSM) were 0.73 mg saponins, 0.01 mg

Table 4.
Growth Performance of Starter Turkeys Fed the Treatment Diets (0–8 weeks)

Parameters	T_1 (0%)	T_2 (7.5%)	T_3 (15%)	T_4 (22.5%)	T_5 (30%)	SEM	*p*
ILW (g/bird)	51.33^{c}	51.34^{bc}	52.25^{ab}	52.73^{a}	50.98^{c}	0.24	.073
FLW (g/bird)	1293.58	1352.08	1331.17	1303.67	1287.00	20.58	.883
TWG (g/bird)	1242.58	1300.78	1278.92	1250.94	1235.94	20.63	.887
ADWG (g/bird)	22.19	23.23	22.84	22.34	22.05	0.37	.959
TFI (g)	4493.81	4613.65	4497.17	4557.47	4480.56	36.78	.816
ADFI (g)	80.25	82.39	80.31	81.38	80.01	2.61	.816
FCR (f/g)	3.62	3.55	3.52	3.65	3.68	0.35	.959
AWM (%)	0.00	0.00	1.39	0.69	0.69	0.25	.220

a, b: Means within the same row followed by different superscripts are significantly different ($p < .05$).
Note: ADFI = Average daily feed intake; ADWG = Average daily weight gained; AWM = Average weekly mortality; FCR = Feed conversion ratio; FLW = Final live weight, ILW = Initial live weight, SEM = Standard error of mean; TFI = Total feed intake, TWG = Total weight gained.

tannins, 0.04 mg flavonoids, 0.34 mg oxalate, 0.13 mg alkaloids and 0.94 mg phytate, while raw avocado pear seed meal (RAPSM) contained 0.89 mg saponins, 0.03 mg tannins, 0.04 mg flavonoids, 0.10 mg oxalate, 0.20 mg alkaloids, and 1.28 mg phytate. Proximate composition of APSMs is also presented in Table 1. The results indicated that the PAPSM used in turkey diets had 89.00% dry matter, 17.05% CP, 8.60% crude fat, 5.80% fiber, 1.80% ash, 55.75% nitrogen-free extract, and 3279 ME (kcal/kg). Those of the RAPSM comparably were 88.60% dry matter, 14.80% CP, 8.20% crude fat, 5.90% fiber, 2.70% ash, 57.00% nitrogen-free extract, and 3210 ME (kcal/kg). Presented in Table 4 is the growth parameter of turkeys fed the treatment diets in which avocado seed meal replaced maize. The initial body weight of the turkey poults ranged from (50.98–52.73 g) per turkey. All the growth parameters examined in this study were not significantly different ($p > .05$). No significant differences ($p > .05$) between final live weight, weight gain, feed intake, FCR, and mortality of the experimental starter turkeys. However, there are significant differences ($p < .05$) in the poult's initial weight. Those fed diet 4 was significantly higher ($p < .05$) but similar ($p > .05$) to those fed diet 3, whereas the least were those fed diets 1 and 5, which were similar ($p > .05$). Since significant differences exist in the initial body weight, ANCOVA was used to test the interaction of the treatment and covariate of initial body weight as shown in Tables 5 and 6. The interaction between treatment and initial body weight was not significant ($p > .05$), indicating homogeneity of regression slopes. Therefore, neither treatment nor the covariate significantly influenced final live weight ($p > .05$).

Table 5.
Effects of Treatment on Final Live Weight of Starter Turkeys Adjusted for Initial Body Weight

Sources of Variation	*df*	*F*	*p*
Treatment	4	0.210	.922
Initial	1	0.471	.523
Treatment *IBW	4	0.207	.924

Table 6.
Adjusted Means for Final Live Weight

Treatment	Adjusted Final Live Weight (g) ± SEM
T_1 (0%)	1285.87 ± 72.48
T_2 (7.5%)	1289.94 ± 86.88
T_3 (15%)	1343.73 ± 171.09
T_4 (22.5%)	1863.02 ± 1120.28
T_5 (30%)	1255.14 ± 75.64

Means did not differ significantly ($p > .05$).
Note: IBW = Initial body weight; SEM = Standard error of mean.

The carcass yield and cut-parts of starter local turkeys fed the treatment diets in which avocado seed meal replaced maize are presented in Table 7. There was a significant difference ($p < .05$) among the parameters examined except the wing. The dressed weight of turkey poults on diet 4 were significantly different ($p < .05$) than other groups but similar ($p > .05$) to diets 2 and 5. The dressed weight of those on diet 4 was highest in numeric value (875 g), followed by diet 5 (841 g) and diet 2 (821 g) while diet 1 had the least value (814 g) of dressed weight. The dress percentage of turkeys followed a similar pattern. Those placed on diet 4 (67.15%) were similar ($p > .05$) to those fed diets 1 (62.93%) and 5 (65.62%), but significantly differ ($p < .05$) from those fed diets 2 (60.86%) and 3 (61.50%), which were similar ($p > .05$). There was a significant difference ($p < .05$) between the percentage breast weight. Diet 1 was significantly higher ($p < .05$) than others but similar ($p > .05$) to diet 5 while diet 3 had the least value (27.32%). The thigh weight of the turkey poults fed diet 5 and 4 was significantly higher ($p < .05$) than other groups, while diet 1 had the least value (14.45%). The drumstick weight of the turkey birds fed diet 2 also was significantly higher ($p < .05$) than other groups, followed by diets 3 and 5, whereas diet 4 had the least value of (14.86%). The back cut of the poults fed diet 4 was significantly higher ($p < .05$) than others, followed by diet 3 whereas diet 5 had the least value of (20.26%). In Table 8, the results of internal organ proportions of turkeys fed the treatment diets in which avocado seed meal replaced maize are shown. There were significant differences ($p < .05$) in all the organ parameters evaluated. The total viscera of turkey poults on diet 5 were significantly higher ($p < .05$) than those fed control diet but similar ($p > .05$) to diets 2, 3, and 4 whereas diet 1 had the least value (10.59 g). The heart of turkey poults on diet 4 was significantly

Table 7.
Carcass Yield and Cut-Parts of Starter Turkeys Fed the Treatment Diets

Parameters	T_1 (0%)	T_2 (7.5%)	T_3 (15%)	T_4 (22.5%)	T_5 (30%)	SEM	*p*
LW (g/bird)	1293.58	1352.08	1331.17	1303.67	1287.00	20.8	.883
DW (g/bird)	814^{b}	821^{ab}	816^{b}	875^{a}	841^{ab}	8.91	.013
DP (%)	62.93^{ab}	60.86^{b}	61.50^{b}	67.15^{a}	65.62^{ab}	0.87	.071
Breast (%)	29.29^{a}	27.97^{b}	27.32^{b}	27.43^{b}	28.50^{a}	0.32	.013
Thigh (%)	14.45^{b}	14.57^{b}	14.53^{b}	15.56^{a}	15.72^{a}	0.18	.021
Drumstick (%)	15.18^{bc}	16.15^{a}	16.13^{a}	14.86^{c}	15.93^{ab}	0.18	.025
Back cut (%)	20.34^{b}	20.78^{b}	22.01^{a}	22.06^{a}	20.26^{b}	0.25	.008
Wings (%)	17.64	18.22	17.84	18.06	17.76	0.13	.725

a, b, c: Means within the same row followed by different superscripts are significantly different ($p < 0.05$).
Note: DP = Dressing percentage; DW = Dressed weight; LW = Live weight; SEM = Standard error of mean.

Table 8.
Internal Organ Proportions of Starter Turkeys Fed the Treatment Diets (0–8 weeks)

Parameters	T_1 (0%)	T_2 (7.5%)	T_3 (15%)	T_4 (22.5%)	T_5 (30%)	SEM	*p*
Live weight (g/bird)	1293.58	1352.08	1331.17	1303.67	1287.00	20.58	.883
Total viscera (%)	10.59^{b}	12.90^{a}	13.54^{a}	12.35^{a}	13.58^{a}	0.34	.006
Heart (%)	0.38^{b}	0.52^{ab}	0.45^{b}	0.61^{a}	0.48^{ab}	0.03	.049
Liver (%)	1.85^{b}	2.45^{a}	2.17^{ab}	1.84^{b}	2.26^{a}	0.08	.020
Lungs (%)	0.92^{a}	0.67^{ab}	0.52^{b}	0.84^{a}	0.69^{ab}	0.05	.036
Kidney (%)	0.62^{ab}	0.74^{ab}	0.82^{a}	0.52^{b}	0.62^{ab}	0.42	.016
Spleen (%)	0.00	0.00	0.00	0.00	0.00	0.00	.000
G/P (%)	3.32^{b}	4.23^{a}	4.10^{ab}	3.76^{ab}	3.67^{ab}	0.12	.121
LSI (%)	3.48^{c}	4.30^{bc}	5.12^{ab}	4.50^{bc}	5.38^{a}	0.24	.004

a, b, c: Means within the same row followed by different superscripts are significantly different ($p < 0.05$).
Note: G/P = Gizzard/Proventriculus; LSI = Large and small intestine; SEM = Standard error of mean.

higher ($p < .05$) than other groups, but similar ($p > .05$) to diets 2 and 5. The liver of turkeys on diet 2 was significantly higher ($p < .05$) than turkeys on diets 1 and 4 but similar ($p > .05$) to diet 3 and 5, respectively. Also, the lungs of turkeys fed diet 1 was significantly higher ($p < .05$) than turkeys on diets 3 but similar ($p > .05$) to others while turkeys on diet 3 had the least value (0.52%). The kidney of turkeys on diet 3 was not significantly different ($p > .05$) from turkeys on diets 1, 2 and 5 but were significantly higher ($p < .05$) than turkeys on diet 4 which had the least value (0.52%). The gizzard + proventriculus of turkeys fed diet 2 (4.23%) was significantly higher ($p < .05$) than diet 1 (3.32%) but similar to other groups. However, turkeys fed diet 5 (5.38%) was higher ($p < .05$) than others in terms of intestine. The least was reported in turkeys fed diet 1 (3.48%).Table 9 is the result of the feed-cost benefit of turkeys in which avocado seed meal replaced maize. The total feed consumed (g/poult), weight gained, cost per weight gained, revenue, and gross margin were not significantly different ($p > .05$) among the treatment groups. The result showed that the cost per kg of individual experimental diets in dollars ranged between (0.18$–0.19$), and diet 1 had the highest cost of 0.19$ per kg diet, while diet 5 had the least cost of 0.18$ per kg diet. The cost of production of turkeys fed diet 1 was significant higher ($p < .05$) than turkeys on diets 5 but similar ($p > .05$) to other groups, while turkeys on diet 5 had the least value of 0.80$.

Discussion

The phytochemicals of PAPSM showed a sharp decline when compared to the RAPSM. The processing method undoubtedly reduced the inherent phytochemicals, making it tolerable for starter local turkeys' consumption (Joseph Runyogote et al., 2021). The values reported in this study are less than those reported by Oluwaniyi et al. (2017)and Egbuonu et al. (2018). Other higher values were reported by Adegoke et al. (2012). The processing method used has contributed to the lower values, making 24 hours soaking and sun-drying a good processing method suitable for achieving reduction in phytochemicals (Joseph Runyogote et al., 2021).

There was a higher dry matter in PAPSM compared to RAPSM. Processing most importantly increased both the CP, ether extracts, NFE, and energy values of the test ingredient. However, there was a slight decrease in CF and ash. The values of dry matter, CP, CF, crude fat, ash, moisture, and energy reported in this present study could be compared to those of maize, which has 7.0% CP, 4% EE, 3% CF, and 3350 ME (kcal/kg) (NIAS, 2020), respectively. Thus, PAPSM could replace maize in the diets of poultry.

The similarities in the performance parameters of the experimental starter local turkeys mean that nutrient to nutrient replacement

Table 9.
Feed-Cost Benefit of Starter Turkeys Fed the Treatment Diets (0–8 weeks)

Parameters	T_1 (0%)	T_2 (7.5%)	T_3 (15%)	T_4 (22.5%)	T_5 (30%)	SEM	*p*
TFI (g/bird)	4493.81	4613.65	4497.17	4557.47	4480.56	36.78	.816
Cost/kg ($/bird)	0.19	0.189	0.186	0.184	0.180	1.71	.000
Cost/Pd ($/bird)	0.868^{a}	0.875^{a}	0.840^{ab}	0.837^{ab}	0.809^{b}	12.95	.009
WG (g/bird)	1242.58	1300.78	1278.92	1250.94	1235.94	20.63	.887
Cost/WG($/bird)	1.01	0.98	0.95	0.97	0.96	0.02	.889
Revenue ($/bird)	1.288	1.348	1.325	1.297	1.324	30.95	.883
GM ($/bird)	0.419	0.474	0.485	0.459	0.472	32.33	.931

a, b: Means within the same row followed by different superscripts are significantly different ($p < .05$).
Note: Cost/PD = Cost per production; GM = Gross margin; SEM = Standard error of mean; TFI = Total feed intake; WG = Weight gained.

level of maize to APSM affirms that PAPSM could replace maize poultry diets, local poults in particular. Processed avocado pear seed meal possessed good protein content and possibly has a growth stimulating effect, as high level of protein is essential for body growth (Egbuonu et al. 2018). The CP of PAPSM almost made it a protein source. The range of FCR (4.96–5.58) of the indigenous turkeys reported by Ayodele et al. (2016) was higher than the range (3.52–3.68) reported in this study. All dietary treatments were efficiently utilized and had no adverse nutritional effects or mortality. Processed avocado pear seed meal contains carbohydrates, moderate proteins, fats, minerals, and phytochemicals with antioxidant activity. At low levels of inclusion, these may improve gut health, nutrient utilization, feed efficiency, and body weight gain (Falowo et al., 2025). Studies in broilers showed that low dietary levels (0.5%–1.0%) improved final body weight and weight gain (George et al., 2020).

The absence of significant covariate treatment effect on final live weight further strengthened the fact that as novel feedstuff, the inclusion of experimental diets supported growth performance comparable to the base diet as supported by Babatunde et al. (2021) in his study with other non-conventional feedstuffs. This indicates that the test ingredient, at the levels used, did not adversely affect nutrient utilization and growth potentials of the poults (Veldkamp et al., 2020). Furthermore, the non-significant effect of initial body weight implies that early weight difference was not sustained to market age, possibly due to compensatory growth and uniform management conditions.

Carcass yield refers to the amount of eviscerated carcass without neck, feet, and giblets. This value expressed as a percentage of live weight gives carcass yield (dressed weight) percentage (Jude Abayomi, 2025). The range (60.86%–67.15%) of percentage dressed weight obtained in the study was comparable to the value (61.53%–75.70%) reported by Ayodele et al. (2016) using indigenous turkeys. The proportion of dressed weight to live body weight is often used as a measure of meat production in farm animals, although eviscerated poultry carcasses are not completely comparable with the dressed carcasses of other kinds of livestock.

Changes in the relative weights of internal organs, particularly the total viscera, are widely recognized as sensitive indicators of physiological adaptation to dietary inclusion of novel feed ingredients (Jude Abayomi, 2025). The observed variations in organ proportions among local turkeys fed the experimental diets may therefore reflect increased digestive and metabolic activity, consistent with the findings of Bangar et al. (2022).

The marginal increase in liver proportion may be linked to its pivotal role in intermediary metabolism, including carbohydrate, protein, and lipid metabolism, as well as its involvement in biosynthesis, detoxification, blood coagulation, and urea production. Similar adaptive responses may also be expected in other visceral organs such as the heart, lungs, kidneys, spleen, gizzard, and intestines due to their complementary physiological functions (Atiba et al., 2024).

Notably, the absence of adverse effects on organ weight proportions suggests that the processing of APSM effectively reduced anti-nutritional factors to tolerable levels, thereby supporting its safe inclusion in turkey diets. The proportions obtained in the present study are comparable to proportions obtained by Eze et al. (2025b) in grower turkeys when different levels of CP and amino acids were used in local turkeys.

Cost per weight gained had been employed by many workers as an economic index to express the economic efficiency of using diets (Ayodele et al., 2016). Diet 5 was therefore economically less efficient than other diets, followed by diets 4 and 3, respectively. The result agreed with the findings of Tesfaye et al. (2017) that least-cost feed formulation seeks to achieve cost input minimization and output maximization. Therefore, the treatment diets where avocado seed meal replaced maize command a higher market price and profit per turkey than turkeys on diet 1 (control). Since the optimum benefit occurred among those fed PAPSM with lower cost/kg gain, with comparable biological performance, this clarified the efficiency of diets containing PAPSM.

Conclusion Recommendations

Avocado pear seed meal contains a diverse number of nutrients and phytochemical compounds of nutritional value. This study has demonstrated that APSM possesses good feeding potential as an energy source in the diet of local turkeys for optimum growth and economic viability. The use of APSM-based diets would also assist poultry farmers in producing and making animal protein more readily affordable to Nigerians, thereby maximizing profit in the poultry industry.

The present study showed that up to 30% replacement of maize with APSM in the diet of turkeys could be adopted and good performance would be achieved. This implies that the dietary treatments (diets 2, 3, 4 and 5) could meet the nutritional requirement of local turkeys, especially for protein and energy, and could also support weight gain of turkeys by helping to reduce the problem of inadequate supply of protein to average Nigerians. Avocado pear seed meal is a good source of dietary protein, and its high fat content could contribute calories to animal ration.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

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