Performance Evaluation of Tokbari Chicken Fed with Cassava Flour

T.K. Das[1], B.C. Debnath[2], J. Debnath[1], B.K. Sarkar[3], B Debroy[4]

[1]Department of Livestock Farm Complex, [2]Department of Animal Nutrition, [3]Department of Livestock Product Technology, [4]Department of Veterinary Pathology, College of Veterinary Sciences & A.H., R.K. Nagar, West Tripura, India
*Corresponding Author's Email: tapanndri@gmail.com

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Abstract

The effect of cassava flour on growth performances in Tokbari chicken was assessed in the present study. A total of 200-day-old Tokbari chicks were randomly divided into 4 dietary treatment groups [Control diet, 10% Cassava flour (T_1), 15% cassava flour (T_2), and 20% cassava flour (T_3)] with 5 replicates of 10 birds in each. The duration of the study was 8 weeks. At 15% and 20% level, there was significant effect ($P<0.05$) in decline of body weight gain than control group. No effect was observed on feed consumption and FCR in all the supplemented groups. Except albumin and uric acid, no remarkable changes ($P>0.05$) were observed on serum biochemical indices. There was no differences ($P>0.05$) on carcass traits. Metabolizability of OM, CF and NFE significantly ($P<0.05$) reduced in T_1, T_2 and T_3 group. Highest profit ($P>0.05$) per kg live body weight was noticed in 10% supplemented group. In conclusion, cassava flour might be effectively supplemented up to 10% level for Tokbari chicken production without any negative effect on production performances.

Key words: Feed; Body weight gain; Carcass; Growth; Cassava flour

Introduction

Commercial poultry ration mainly comprise of energy rich feed ingredients like cereal grains. Approximately 45-60% of ration, is contributed by maize because of its high energy content and low level of anti-nutritional factors (Donkoh & Attoh-Kotoku, 2009). However, the production of maize is not adequate for direct consumption of human, formulating ration for livestock, and for various industrial applications. This deficiency led to an increase in the maize prices as well as led to high cost of production in intensive poultry farming. The competition between human and livestock for cereals leads to search for other alternative energy sources such as cassava flour as a substitute for maize in poultry rations (Bhuiyan et al., 2012).

Cassava (*Manihot esculenta*) is widely used main food cultivated in both tropical and subtropical countries around the globe. It can thrive well in soil with low fertility and also resistant in drought conditions. In terms of energy yield per unit area, it is known as the most productive crop (Ravindran and Blair, 1992). It serves as the cheapest source of calories in animal diets as it provides carbohydrate approximately 40% higher than rice and 25% more than maize (Tonukari, 2004). On DM basis, it comprises 3000 metabolizable energy per kg, 2.55% crude protein (CP), 27.75% crude fibre (CF), 0.12% ether extract (EE) and 1.70% total ash (Sriroth et al., 2000). Recent approach for the unorganized sector as described in the National Action Plan for Egg and Poultry-2022 seeks to convert backyard poultry into a commercially viable economic model (DoAHD&F, GOI, 2019). Specifically, introduction of low input technology (LIT) birds is suggested for the transition and with an extension plan up to 1,000-2,000 birds for larger commercial poultry production. Moreover, the plan stresses alternative breeds development and LIT birds to augment family poultry systems (DoAHD&F, GOI, 2019). At present, there is an accelerating demand for the meat and eggs of backyard or indigenous chicken in India (Singh et al., 2026 and Africa (Tadese et al., 2024). The cost for indigenous chicken meat and eggs have bettered than commercial table eggs and broiler meat. In some regions, to increased consumer interest, these products are even sold as organic. Therefore, it is becoming essential to rear indigenous chickens for both egg and meat by providing balanced poultry feeds. Using alternative and cost-effective ingredients, such as cassava flour, to reduce cost of production may represent a opportunities for poor and marginal farmers.

Tokbari is a dual purpose hybrid chicken (multi-colored) developed by Indian Council of Agricultural Research (ICAR) for NEH region, Lembucherra, West Tripura, India by crossing of colored broiler, native Tripura black and Dalhem Red. Genetic inheritance of this developed variety chicken is coloured broiler (25%), Tripura black (25%) and Dahlem Red (50%). This variety has moderate body weight with multi-colored feathered pattern, good scavenging habits and much suitable for backyard poultry farming. They can produce three times more egg than native bird (Fig 1). Numerous studies have been conducted on the impact of varying levels of cassava flour on the performance of broilers (Souleymane et al., 2024; Okrathok, S and Khempaka, 2019), layers (Rapha€ el al., 2013), duck (Sahoo et al., (2014). However, there exists a remarkable gap in systematic research regarding the use of cassava flour in poultry nutrition, especially for LIT birds like Tokbari. Moreover, this research may be first report on Tokbari chicken. Therefore, this study aims to assess the extent to which cassava flour can be supplemented in the diet of Tokbari chickens to enhance production performance, carcass traits, nutrient digestibility and serum biochemistry.

Fig 1: Tokbari chicken

Materials and Methods

Locale and preparation of leaves

The present study was conducted at the Poultry shed of College of Veterinary Sciences and A.H., R.K. Nagar, West Tripura, India (23.8713^0N, 91.3527^0E). The climate was tropical, the elevation was 305 m (1001′), the annual rainfall was around 2100-2200 mm and ambient temperature ranged between 22°C and 36°C. Cassava Roots were collected from Fodder Complex, College of Veterinary Sciences & A.H., R.K. Nagar. Then it was deskinned, washed, chipped and spread on a polythene sheet and dried under sunlight with regular turning for 2-3 days till the moisture content is reduced to around 14% and then kept in hot air oven at 100˚C for 12 hrs. The dried samples were then processed using a grinder to get a particle size of 0.5 mm and were subsequently added into the feed to formulate the treatment diets. All procedures used in the experiment were reviewed and approved by the Institutional Animal Ethics Committee of the college (F.1/GEN/IAEC/CVS/RKN/2020). The experiment was carried out in Poultry Shed of the Livestock Farm Complex, College of Veterinary Sciences and A. H., R. K. Nagar, Agartala, Tripura, India.

Table 1. Ingredient and calculated composition of experimental diets

Ingredients	Dose of Cassava			
	Control	**T_1**	**T_2**	**T_3**
Maize	49.50	39.00	35.00	32.00
Soybean	23.80	25.30	26.00	27.20
Wheat bran	22.40	21.40	20.10	17.00
Cassava flour	-	10.00	15.00	20.00
DCP	2.00	2.00	1.40	1.60
LSP	1.20	1.20	1.40	1.20
Iodized salt	0.30	0.30	0.30	0.30
Feed additive premix*	0.79	0.79	0.79	0.79
Chemical composition (g kg^{-1})[1]				
ME (Kcal kg^{-1})[2]	2640	2606	2619	2651
DM	90.60	91.74	91.86	91.71
CP	18.52	18.53	18.50	18.50
EE	1.20	1.29	1.00	1.96
CF	4.48	4.55	5.63	5.81
TA	6.10	6.90	6.40	6.20
NFE	69.70	68.73	68.47	67.53
OM	93.90	93.10	93.60	93.80
Ca	1.00	1.03	1.00	1.00
Total phosphorus	0.73	0.72	0.61	0.61
Lysine[2]	1.18	1.19	1.18	1.16
Methionine[2]	0.39	0.38	0.37	0.35

*Includes mineral supplement 0.15, vitamin supplement 0.06, Choline chloride 0.10, Maduramycin 0.05, Sodium bicarbonate 0.25, Antioxidant (BHT) 0.01, Biophos 0.015, Toximar 0.05, Probios 0.05, Enzyme 0.05; Mineral supplement per kg of diet: Zn, 60 mg; Mn, 90 mg; Fe, 110 mg; KI, 2.5 mg;Each gm contains (Ventremix): vitamin A, 82,500 IU; vitamin B2, 50 mg; vitamin D3, 12,000 IU; vitamin K, 10 mg; Each gm contains (Ventribee Plus): vitamin B1, 4 mg; vitamin B6, 8 mg; vitamin B_{12}, 40 mg; vitamin E, 40 mg; calcium-D-pantothenate, 40 mg; niacin, 60 mg.
[1]Assayed values, [2]Calculated on the basis of standard values applicable under Indian Condition (Singh and Panda, 1996)

Housing and management

Following a completely randomized design, 200 one-day-old Tokbari chicks of average body weight (33.32 ±1.16) were allocated into four treatment groups with 50 birds in each. Each group was further sub-divided into 5 replicates with 10 birds in each replicate. Four dietary treatments were formulated: Control (basal diet), T_1 (basal diet with 10% cassava flour), T_2 (basal diet with 15% cassava flour) and T_3 (basal diet with 20% cassava flour). The ingredient and chemical composition of all basal diet is shown in Table 1. In a conventional poultry shed, birds were accommodated in 20 pens each measuring 10.56 sq. feet (3.25 ×3.25 feet). In the brooder cum grower house, birds were maintained in deep litter system up to 8 weeks. Vaccination was performed against Newcastle disease (at 5th and 21st day with NDB_1 and Lasota strain, respectively) and Infectious Bursal Disease (at 12th day).

Growth performance parameters

Weekly body weight and feed intake were recorded and overall (0-4 weeks, 5-8 weeks and 0-8 weeks) body weight gain, feed intake, feed conversion ratio (FCR) was calculated. Mortality was recorded as and when it occurred. Feed conversion ratio was calculated on the basis of cumulative feed intake and weight gain in each replicate after correcting for mortality

Measurement of carcass traits

At the end of the 8-week feeding trial, 5 birds from each treatment group were weighed, fasted for overnight and then slaughtered ethically, de-feathered and eviscerated. The hot carcass was weighed and the weight of different body parts viz., thigh, breast, drumstick, back and giblets (liver, gizzard, heart and lungs) were weighed.

Biochemical parameters

At the end of the experiment, around 5 ml blood was collected from the wing vein and stored in sterilized glass tubes. Serum was separated by centrifuging the whole blood at 2500 rpm for 10 minutes and stored in deep freeze at -20^{0}C for further analysis of different blood parameters. Serum glucose, total cholesterol, total protein, albumin, globulin, aspartate amino transferase (AST), alanine amino transferase (ALT) and uric acid were estimated by automatic blood analyzer (Microlab 200, E-Merck India Ltd.) using commercial commercial kits (Prism diagnostic Pvt. Ltd., Mumbai, India) in an UV-visual spectrophotometer (Microlab 200: Merck Laboratory Analyser, New Delhi, India). Hemoglobin level in blood was estimated by cyanmethemoglobin method using UV Spectrophotometer. Proximate principles in feed samples were estimated as per methods described in AOAC (2011). Duplicate measurements were performed for all the samples and standards.

Nutrient metabolizability study

For the studies of metabolizability, one bird (each replicate) close to the average BW was selected and separately housed in wire floor cage. Excreta was collected for 7 days after three days adaptation period. Daily feed consumption and fecal output from each bird was quantified. The excreta samples (100 g) from each replicate was collected every day in a previous weighed clean and dry Petri dish and were dried in hot air oven (100 ± 2^{0}C), pulled together and preserved for subsequent analysis. The pooled feed and fecal sample were subjected for analysis of dry matter (DM), organic matter (OM), crude protein (CP), crude fibre (CF), nitrogen free extract (NFE) and ether extract (AOAC, 2011).

Economy of production

The economics was calculated by considering cost of raw ingredients, additives and other supplements and then computing the cost of feed.

Statistical analysis

All analysis was done using Sigma Plot 11.0 software package. The results were expressed as the mean and pooled standard error (SE) of mean. Significance was tested by using one way ANOVA considering treatment group as a factor with the following model

$$Y_{ij} = \mu + T_i + e_{ij}$$

where, Y_{ij} is the observation associated with each attribute; μ is the overall mean; T_i is the effect of ith treatment groups (i=1, 2, 3 & 4) on each attribute; and e_{ij} is the random error. For comparison between treatment and control groups, Holm-Sidak / Duncan's Multiple Range test was used. Probability values of P<0.05 were stated as significant. No statistical analysis was performed for cost calculation of different basal diets. The specific P-values were mentioned in the text where there is a significant difference.

Results

Growth performance

The results relating to growth performance are summarized in Table 2. The data showed that chickens receiving a 20% cassava flour (T_3) exhibited significantly reduced body weight gain (BWG) during the 0-4 week and 0-8 weeks periods in comparison to control, T_1 and T_2 groups, while no differences (P>0.05) were detected between T_1, T_2 and T_2, T_3. However, during the 5-8 weeks, dietary supplements did not produce any significant effects (P>0.05).

No significant differences (P>0.05) were found in feed intake between the control and other treatment groups during the 0-4, 5-8 and 0-8-weeks period (Table 2). However, compared to control, in T_2 and T_3, feed intake reduced numerically @12.62%, 17.84% (5-8 weeks) and 9.06% and 14.93% (0-8 weeks), respectively.

Feed Conversion Ratio (FCR), which indicates the efficiency of feed utilization, was not significantly different between the treatment groups and the control. Among the three dietary levels, FCR was mostly poor (P>0.05) in the T_2 and T_3 groups compared to control. However, compared to control, in T_2 and T_3, FCR was numerically poor by 3.55%, 2.63% during 5-8 weeks and 4.66% and 3.97% during 0-8 weeks, respectively.

Carcass characteristics

Dietary supplement did not have a significant effect on carcass characteristics (P> 0.05) as shown in Table 3. In this experiment, though there was no difference (P>0.05) on relative weight of thigh, drumstick, wings and gizzard, but numerically it showed 4.87%, 2.84%, 10.89% and 36.30%, respectively improvement in T_1 group. Carcass yield, dressed weight and dressing percentage were lower due to the poor growth performance of experimental birds.

Biochemical parameters

The health of the experimental birds as assessed by biochemical analysis was not affected by inclusion of cassava flour in ration of Takbari chicken. There was significant reduction (P<0.05) in serum albumin (g/dl) and uric acid (mg/dl) in T_1 group than T_2 and T_3. No statistically significant differences (P>0.05) were detected in other serum biochemical parameters among the dietary treatment groups (Table 4).

Table 2. Effect of dietary supplementation cassava flour on production performance of Tokbari chicken

Attributes	Dose of MBL				SEM	P value
	C	T_1	T_2	T_3		
BWG (g/bird)						
0-4 weeks	227.92^{b}	215.30^{ab}	209.14^{ab}	194.52^{a}	4.63	0.047
5-8 weeks	486.27	449.02	413.05	402.03	13.54	0.087
0-8 weeks	714.19^{b}	664.32^{ab}	622.19^{ac}	596.54^{c}	15.95	0.015
Feed intake (g/bird)						
0-4 weeks	798.35	800.51	789.00	736.82	10.36	0.068
5-8 weeks	1963.77	1870.77	1743.67	1666.46	44.69	0.054
0-8 weeks	2762.11	2671.27	2532.67	2403.29	53.13	0.053
Feed conversion ratio (FCR)						
0-4 weeks	3.50	3.73	3.78	3.79	0.05	0.206
5-8 weeks	4.08	4.19	4.23	4.19	0.14	0.990
0-8 weeks	3.89	4.03	4.08	4.04	0.10	0.940

Means bearing superscripts in the same row differ significantly (P<0.05). SEM: Standard error of mean, P: Probability

Table 3. Effect of dietary supplementation of Cassava flour on Carcass traits, cut up parts and relative organ weight (% of dressed yield) of Tokbari chicken

Attributes	Dose of MBL				SEM	P value
	C	T_1	T_2	T_3		
Carcass yield	558.67	568.33	557.67	542.00	17.51	0.886
Dressed yield	65.12	65.22	63.37	63.25	1.09	0.902
Breast	26.08	24.23	25.51	25.17	0.73	0.878
Neck and back	28.21	27.31	30.16	28.52	0.69	0.584
Thigh	16.21	17.00	15.14	16.99	0.57	0.682
Drumstick	15.82	16.27	14.68	15.20	0.53	0.784
Wings	13.68	15.17	14.51	14.12	0.26	0.228
Liver	3.52	3.45	4.03	3.13	0.15	0.227
Gizzard	4.27	5.82	4.78	4.57	0.23	0.085
Heart	0.97	0.96	1.01	0.94	0.02	0.825
Pancreas	0.42	0.34	0.42	0.38	0.03	0.821
Spleen	0.33	0.34	0.34	0.28	0.02	0.760

Means bearing superscripts in the same row differ significantly (P<0.05). SEM: Standard error of mean, P: Probability

Table 4. Effect of dietary supplementation of cassava flour on Serum Biochemical parameters of Tokbari chicken

Attributes	Dose of MBL				SEM	P value
	C	T_1	T_2	T_3		
Hemoglobin (g/dl)	16.21	16.07	16.90	16.82	0.29	0.695
Glucose (mg/dl)	226.61	239.77	244.68	237.75	4.51	0.977
Total Protein (g/dl)	3.59	3.22	3.47	3.33	0.06	0.536
Albumin (g/dl)	1.38^{ab}	1.17^{a}	1.38^{b}	1.31^{b}	0.03	0.018
Globulin (g/dl)	2.20	2.05	2.09	2.02	0.05	0.957
A:G ratio	0.64	0.53	0.61	0.58	0.02	0.433
Cholesterol (mg/dl)	234.26	248.86	251.27	214.94	6.21	0.140
Serum enzymes						
Aspertate amino transferase (IU/L)	166.68	161.53	167.53	168.40	1.51	0.410
Alanine amino transferase (IU/L)	25.58	21.08	20.49	20.93	1.07	0.310
Kidney function test						
Uric acid (mg/dl)	2.69^{a}	2.65^{a}	4.12^{b}	3.79^{b}	0.18	<0.001

Means bearing superscripts in the same row differ significantly (P<0.05). SEM: Standard error of mean, P: Probability

Table 5. Effect of dietary supplementation of Cassava flour on Metabolizability of nutrients in Tokbari chicken

Attributes	Dose of MBL				SEM	P value
	C	T_1	T_2	T_3		
DM	67.85	66.16	65.99	66.79	1.26	0.962
OM	64.00^{b}	59.24^{a}	61.04^{a}	60.66^{a}	0.59	0.006
EE	72.56	69.39	69.15	60.66	1.23	0.712
CP	66.09	63.76	63.75	67.74	1.48	0.875
CF	13.23^{b}	12.22^{a}	12.11^{a}	12.35^{a}	0.12	<0.001
NFE	75.28^{b}	73.21^{a}	72.78^{a}	73.32^{a}	0.32	0.005

DM: Dry matter; EE: Ether extract; CP: Crude protein; CF: Crude fibre; SEM: Standard error of mean; P: Probability. Means bearing superscripts in the same row differ significantly (P<0.05).

Table 6. Effect of dietary supplementation of Cassava flour on Economics of production in Tokbari chicken

Attributes	Dose of MBL				SEM	P value
	C	T_1	T_2	T_3		
Intake of feed/bird (kg)	2.76	2.67	2.53	2.40	0.05	0.053
Cost of feed/kg	32.10^{b}	31.32^{ab}	30.76^{a}	30.56^{a}		0.011
Total cost of feed/bird	88.66	83.66	77.90	73.44	2.02	
Fixed cost/bird	37	37	37	37		
Total expenditure/bird	125.66^{b}	120.66^{ab}	114.90^{a}	110.44^{a}	2.02	0.011
Final BW (kg)	0.750^{b}	0.700^{ab}	0.657^{ac}	0.633^{c}	0.02	0.015
Cost of live bird@400/kg	299.66^{b}	280.05^{ab}	262.86^{ac}	253.34^{c}	6.34	0.015
Return/bird	174.29	159.39	147.95	142.90	5.61	0.203
Profit/kg live weight	232.42	227.65	225.14	225.62	3.59	0.926

Means bearing superscripts in the same row differ significantly (P<0.05). SEM: Standard error of mean, P: Probability

Nutrient metabolizability

The impact of supplementation of cassava flour on the nutrient metabolizability in Tokbari chickens is illustrated in Table 5. The metabolizability of organic matter (OM), crude fibre (CF) and nitrogen free extract (NFE) significantly (P<0.05) declined in the groups with 10, 15 and 20% supplement compared to the control. Conversely, no significant differences were observed in the metabolizability of dry matter (DM), ether extract (EE), crude protein (CP).

Economics of production

The impact of cassava flour on production economics is detailed in Table 6. Within the treatment groups, the total expenditure per bird was highest (P<0.05) in the T_1 group and lowest in the T_3 group. However, the return per bird and profit per kilogram of live weight were comparatively greater (P>0.05) in the 10% supplement group, followed by the T_3 and T_2 groups. The T_1 group exhibited the highest economic benefit, likely due to greater body weight gain.

Discussion

Growth performance

Present findings related to BWG is similar to findings of Zanu et al. (2017) and Hasan et al. (2012) who reported decreased BWG in broiled chicken fed cassava flour (at 58%) and cassava flour replaced with maize (at 50, 75 or 100%), respectively. Oyewole et al. (2020) also reported reduced BWG, increased FCR in the diet of broiler chicken fed cassava pulp substituting maize. While, Yadav et al (2019) and Ramadhanti et al. (2024) found that both cassava root chips (25%) and cassava pulp in broiler chicken did not influence BWG, feed intake and FCR. Ramadhanti et al. (2024) reported that broilers fed cassava pulp showed similar BWG to control group but no significant differences in weight gain observed among the treatment groups. This finding suggests that cassava pulp can efficiently serve as an alternative energy source to enhance broiler growth like the conventional corn-based diet. In the present study, lower BWG could be attributed to presence of fibre with higher inclusion of cassava flour and also due to cassava induced irritation and difficulty to consume feed at the initial stage of life of chicks (Ngiki et al., 2014).

Use of cassava meal (at 25%) (Hassan et al. 2012) and cassava pulp (at 7.5% and 15%) replacing maize (Ramadhanti et al. 2024) in broiler diet did not affect (p>0.05) feed intake compared to the control group. This is in line with present findings. Likely, Khempaka et al. (2016) also found no differences in feed intake in layers fed dried cassava pulp (at 5, 10, 15, 20, 25%). In contrast, Zanu et al. (2017) showed reduced feed consumption of birds fed with increasing level of cassava diets. Khempaka et al. (2009) also found reduced feed intake of broilers with higher level of cassava. Comparatively lower feed intake (P>0.05) in present Tokbari chicken fed cassava flour might be due to bulky, dusty, and low palatability of the flour that led to a decrease in BWG and decrease FCR.

Findings regarding FCR is at par with Zanu et al. (2017) and Ramadhanti et al. (2024). Similar results were also reported by Okrathok and Khempaka (2019) who noted that cassava pulp as a feed ingredient can improve digestibility without any effect on FCR. Tewe (2004) reported that cassava root meal is not rich in protein but is abundant in other nutrients like Ca, vitamin C, amylopectin, amylose, vitamin B_1, vitamin B_2 and vitamin B_3 which might have positive effect on good performance of experimental chicken fed graded levels of cassava.

Poor FCR in the cassava fed groups might be due to impaired nutrient absorption, which led to reduced BWG. Corn is effectively utilized by the chicken while cassava inclusion in the higher percentage or replacing with corn, adversely affect the morphology of intestinal villus resulting decreased nutrient absorption (Onjoro et al., 1998) and consequently decline in growth performance. Birds with cassava flour diets showed similar FCR (P>0.05) to those receiving corn-based control diet. This suggests that cassava flour can be utilized as an alternative energy source without affecting feed efficiency. Therefore, the inclusion of cassava flour in Tokbari chicken seems to be a promising approach to enhance both BWG and feed efficiency in production.

Carcass characteristics

Slaughter performance is an important index for assessing the carcass quality of meat-producing livestock and poultry. It not only gives a direct indication of the proportion of various tissue types in relation to overall mass but also emphasizes the discrepancies in nutrient deposition among different tissues. This aligns with the results of Ramadhanti et al. (2024) who showed no significant difference in the relative weight of digestive organs (except for duodenum and jejunum) between broilers fed cassava pulp-based diets and those on the corn-based diet. This indicates that cassava pulp inclusion in broiler diets as an alternative energy source did not have a adverse effect on the development and function of the digestive organs. Sugiharto et al. (2019) stated that relative weight of digestive organs acts as an indicator of health and efficiency of the digestive system in broiler.

In contrast, Ojewola et al. (2016) reported decrease in relative weight of gizzard, spleen and proventriculus and increase in relative weight of liver, heart and lungs in broiler chicken. Any type of adverse effects on digestive organs resulted in reduced overall performance of the birds as because of poor feed digestion and nutrient absorption. However, the results of the present study provide clear evidence that the inclusion of cassava flour does not disrupt the normal development and function of the digestive organs. This suggests that cassava flour can be efficiently used as an alternative energy source in Tokbari chicken without affecting digestive health.

Biochemical parameters

Likely, Unigwe (2011), Hassan et al. (2012) and Zanu et al. (2017) reported no harmful effect on blood biochemical parameters in cassava meal fed broiler chickens. Majority of the biochemical values were within the range for healthy birds (Adeyemo and Sanni, 2013). Similar to our findings, Khempaka et al. (2016) reported dried cassava pulp (20%) did not affect cholesterol levels in laying hens. In contrast, Ojewola et al. (2016) reported decreased AST, globulin, glucose. total protein in broiler chicken fed cassava root meal.

Nutrient metabolizability

This may be attributed to the insoluble fiber content of cassava flour. This fiber type has capacity to absorb water during transfer in the gastrointestinal tract and increases the passage time of diets. As a result, efficacy of endogenous enzymes responsible for hydrolyzing and digesting the diet, would be less efficient, ultimately resulting decrease nutrient digestibility and retention. Khempaka et al. (2009) reported decreased nutrient digestibility and retention with increasing level of dried cassava pulp in broiler diets. Similar to our findings, Khempaka et al. (2016) reported dried cassava pulp (20%) did not affect DM digestibility but also showed no effect on OM digestibility which contradict our result. In contrast, Souleymane et al. (2024) showed that DM, OM, CP, EE, CF digestibility significantly decreases at up to 50% level of replacement of cassava flour with maize. In this study, the T_1 group exhibited comparatively greater body weight and FCR among the treatment groups, likely due to enhanced OM, CF and NFE metabolizability.

Economics of production

Observations relating to economics, is in line with Ojewola et al. (2016) who reported the rearing of broiler chicken with cassava root meal was also found to have decreased revenue. Zanu et al. (2017) indicated 48% reduction in the overall feed total cost per bird when cassava flour was included in the diets of broiler chicken in place of maize. This indicates that it was more cost-effective to use cassava flour in substitute for maize. Present findings corroborate with Vantsawa et al. (2007) who reported that the use of less expensive feed resources as a feedstuff in poultry nutrition enhances profit margin of farmers.

Conclusion

In conclusion, cassava flour serves as an effective feed component for Tokbari chickens, enhancing weight gain, feed efficiency and overall chick performance. Consequently, for optimal economic return, it is advisable to incorporate cassava flour at a 10% rate to optimize the performance of Tokbari chickens.

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Conflict of interest

There is no conflict of interest

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