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EFFECT OF FEEDING VARYING REPLACEMENT LEVELS OF DOUM PALM (*Hyphaene thebaica*) PULP MEAL SUPPLEMENTED WITH PREPARED ENZYME ON THE PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

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ABSTRACT
The experiment was carried out to evaluate the effect of feeding diets containing graded levels of Doum Palm (Hyphaene thebaica) Pulp meal (DPPM) to Broiler Chickens supplemented with prepared enzyme. The experiment took place at Teaching and Research Farm, Department of Animal Science, Federal University, Dutse,, Jigawa State. The enzyme was prepared using Sorghum grain. 10g/kg of this prepared enzyme was used in all the treatments except T1. In a completely randomized design 150, day- old broiler chicks (Ross 308 strain) were randomly assigned to five dietary treatments of 30 chicks with three replicates and ten chicks each. The treatments were designated as, T1 (0%), T2 (5%), T3 (10%), T4 (15%) and T5 (20 %.) All broiler management procedures where adhered to. Data collected were subjected to analysis of variance (ANOVA) using SAS (1999) package. The results during starter phase revealed that significant ($p<0.05$) differences exist among some parameters observed. Final weight (781.23g), weight gain (741.77g/b) and daily weight gain (26.92g/d/b) were significantly ($p<0.05$) higher in T2 (5% DPP). However, chicks fed diet T5 (20% DPP) showed significantly ($p<0.05$) higher values (52.44 g/b/d) and feed conversion ratio (2.21) while at finisher phase, the results revealed that only daily feed intake was significantly ($p<0.05$) affected. Final weight was higher in T4 (1993.30g).The results of the analysis of carcass cut-ups on all the parameters examined were not-significantly ($p>0.05$) different except in the values for neck and back. Cost benefit analysis indicated that all the cost studied were highest in T1 (control) in both experiments. It can be concluded that DPPM in diets for broilers led to optimum performance at reduced feed cost. DPPM was therefore recommended as alternative feed ingredient in feeds for broiler chicken up to 20% level of inclusion.

Key words: Doum palm, Broiler chicken, Performance, Enzyme and Cost

1.0 INTRODUCTION
One of the greatest scope for increasing the quality and quantity of protein intake in Nigeria is poultry production, especially the production of broiler chickens which has short generation interval and prolificacy (Omoikhoje *et al.,* 2018), but supplying the adequately and needed animal protein to human populace by Nigerian livestock industry has not been achieved (Akure *et al.,* 2021). This is because one of the biggest constrain that livestock farmers faces is high cost of feed and competition of conventional feed materials between man and livestock (Olajide *et al.* 2019). Adene (2004) reported that feed accounts for 65-80 % of the total cost of production. However, in Nigeria, maize is the most widely used source of energy for poultry which commonly constitutes about 40 to 60% of industrially formulated poultry diets (Heise *et al.,* 2015). But high cost of conventional feed materials especially maize and other cereals, competition between man and farm animals reduces the expansion of this industry (Ibe *et al.,* 2021) as earlier highlighted. Therefore, the focus of feed producers and animal scientists is always searching for alternative feed resources that can substitute for or partially replace the conventional feedstuffs (Matthew *et al.,* 2010). One of such alternative feed ingredient is the Doum palm (*Hyphaene thebaica* L.) fruit. It belongs to palmae family, smell and taste like ginger and with a shinny orange-brown to deep chestnut skin colour;

hence it is referred to as ginger bread in some places (Nwosu *et al.*, 2008). Several authors had previously reported that raw doum palm pulp has some anti-nutritional factors such as tannin, saponin, oxalate and phytate which limit its use as feed for monogastric animals (Shehu *et al.,* 2017; Makinde *et al.,* 2018). These anti-nutritional factors were found to have negative effect on growth performance reported by Makinde *et al.* (2018) who fed broiler chickens with diets containing raw doum palm pulp meal. Studies have previously shown that the use or addition of enzymes in poultry diets has stimulated recent interest to feed manufacturers and livestock producers as a means of improving animals and bird's performance (Raji *et al.,* 2015). This use of exogenous enzymes in the diets allowed more energy release which resulted in the decrease in digestive viscosity in the gastrointestinal tract, and reduces feed costs (Cowieson, 2010). This study was aimed at finding out the effect of feeding Doum Palm (*Hyphaene thebaica*) pulp supplemented with prepared enzyme on the performance of broiler chickens.

2.0 MATERIALS AND METHODS

2.1 Study Area

The experiment was conducted at the Teaching and Research Farm, Department of Animal Science, Federal University Dutse, Jigawa State, Nigeria. The farm is located east of the faculty, and lies between Latitudes 11º 42'30" and 11º44'00" as well as between longitudes 9º23'23" and 9º24'00". The climate of the area (Dutse) is generally described as sahelian; with annual rainfall of 300 to 400 mm per annum and average annual temperature of 21.2ºC in January to 30.9ºC in June. The area is covered iron rich lateritic soil. The attendant environmental challenges of the area include drought and desertification, low level of education and characteristic nature of the people are predominantly farming communities (NAERLS and FMARD, 2020).

Table 1: Ingredients and Calculated Nutrient Composition of the Experimental Broiler Starter Diets (0-4 weeks)

		Treatments DPP (%)			
Ingredients	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**
Maize	51.00	48.45	45.90	43.35	40.80
Doum palm	0.00	2.55	5.10	7.65	10.20
Wheat offal	3.50	3.00	3.00	3.00	3.00
Soybean meal	36.50	36.50	36.50	36.50	36.50
Fish meal	3.50	3.50	3.50	3.50	3.50
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Enzyme	-	+	+	+	+
TOTAL	100	100	100	100	100
Calculated Nutrient Composition					
ME (kcal/kg)	2874	2880.05	2885.71	2891.37	2897.02
Crude protein (%)	23.41	23.31	23.21	23.10	23.00
Crude fibre (%)	3.73	3.95	4.18	4.41	4.65
Ether extract (%)	3.60	3.63	3.66	3.69	3.37
Calcium (%)	1.76	1.78	1.81	1.84	1.86
Available P (%)	0.35	0.31	0.73	0.92	1.11

*Vitamin a 10,000,000iu, Vitamin D3 2000000iu, Vitamin E 23,000mg, Vitamin k3 2000mg, Vitamin B1 1800mg, Vitamin B2 5500mg, Niacin 27500mg, Pantothenic Acid 7500mg, Vitamin B6 3000mg, Vitamin B12 15mg, Folic Acid 750mg, Biotin H2 60mg, Choline chloride 3000000mg, Cobalt 200mg, Copper 3000mg, Iodine 1000mg, Iron 20000mg, Manganese 40000mg, Seleninum 200mg, Zinc 30000mg, Antioxidant 1250mg... *DPP= Doum palm pulp. ME=Metabolizable energy+ = 10g of Prepared Enzyme, P=Phosphorus*

2.2 Experimental Design and Management

A total of one hundred and fifty (150) day-old broiler chicks (Ross 308 strain) were randomly assigned to five dietary treatment groups of thirty (30) chicks in a completely randomized design. Each treatment group was further divided into three replicates of Ten (10) chicks each. The treatment groups were designated as T1, T2, T3, T4 and T5, with T1 having 0% prepared enzyme and Doum palm pulp meal as control. In contrast, the remaining treatments contained 10g/kg prepared enzyme and inclusion levels of the Doum palm (*Hyphaene thebaica*) pulp meal at 5, 10, 15, and 20%, respectively (Tables 1 and 2). They were subjected to same management practices as such water and feed was given ad *libtum* throughout the period of the experiment (56 days).

Table 2: Ingredients and Calculated Nutrient Compositions of the Experimental Broiler Finisher Diets (5-8 weeks)

		Treatments	**DPP (%)**		
Ingredients	**T1**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**
Maize	57.00	54.15	51.30	48.45	45.60
Doum palm	0.00	2.85	5.70	8.55	11.40
Wheat offal	8.00	8.00	8.00	8.00	8.00
Soybean meal	28.00	28.00	28.00	28.00	28.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Bone meal	1.50	1.50	1.50	1.50	1.50
Limestone	0.50	0.50	0.50	0.50	0.50
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Enzyme	-	+	+	+	+
TOTAL	100	100	100	100	100
Calculated Nutrient Composition					
ME (kcal/kg)	3000.00	3002.10	3008.42	3014.75	3021.00
Crude protein	20.85	20.70	20.62	20.50	20.38
Crude fiber	3.96	4.22	4.47	4.73	4.91
Ether extract	3.66	3.70	3.74	3.77	3.81
Calcium	1.04	1.24	1.45	1.66	1.87
Available P	0.27	0.51	0.76	1.00	1.12

***** Vitamin A 8,000,000.00iu, Vitamin d3 1,5000,000.00iu, Vitamin E15,000iu, Vitamin K 2000mg, Vitamin B2 3000mg, Vitamin C 1000mg, Niacin 20000mg Pantothenic Acid 6000mg, Vitamin B6 1500mg, Vitamin B12 10mg, Folic Acid 500mg, Biotin 400mg, Choline Chloride 150000mg, Cobalt 100mg, Copper 600mg, Iodine 10000mg, Iron 15000mg, Manganese 70000mg, Selenium 100mg, Zinc 20000mg, Antioxidant 1250mg... *DPP= Doum palm-pulp.ME=Metabolizable-energy, + = 10g of prepared Enzyme, P=Phosphorus*

2.3 Preparation of Experimental Enzyme

The enzyme was prepared using Sorghum grain in a slightly modified procedure described by Omoikhoje *et al.* (2010). The grain was washed appropriately to remove dirts and other unwanted materials, while lighter particles were detached by winnowing. The clean grains were soaked in water for 48 hours at room temperature until extreme swelling of the grain was attained. Carbondioxide and soluble toxins might possibly reduce and to ensure reduction in microbial growth as the water was changed twice. The water was drained and the grains washed with fresh water. The grains were spread on clean mart, permitted air

passage, and then sheltered with another moist cloth till it sprouted. The germinated sorghum grains (malted sorghum) were washed with clean water and shade dried. The malted sorghum grain was milled into powder. The grain contained the enzymes which can degrade the fibre components of feedstuffs at this point. Exactly 10g/kg of this prepared enzyme was used in all the treatments except treatment one.

2.3 Data Collection

2.3.1 Feed Intake

Data on daily feed intake were recorded. Feed consumed from each treatment was measured on daily basis by subtracting left over from feed offered. The mean daily feed intake was calculated on weekly basis by dividing the amount of feed consumed by the number of birds in the replicate.

2.3.2 Live Weight Gain

Each bird was weighed using digital weighing scale to determine the live weight gain on weekly basis. The mean live weight of each treatment group was determined by dividing total weight by the total number of birds in the group.

2.3.3 Feed Conversion Ratio

This was measured by dividing the mean feed intake per bird in grams by the mean live weight gain per bird for each treatment group. This was obtained on a weekly basis.

$$\text{Feed conversion ratio} = \frac{mean\ feed\ intake\ (g)}{Mean\ live\ weight\ gain\ (g)}$$

2.3.4 Carcass Measurements

At the end of the feeding trial, one bird per replicate was randomly selected, fasted for 12 hours so as to clear the gut of pervious meal and slaughtered using the Halal method. The slaughtered birds were scalded, de-feathered and eviscerated. The carcass was divided into the following parts: shank, head, breast, neck, drumsticks, thighs, wings and breast cage, while the visceral organs include liver, gizzard, proventriculus, heart and crop were weighed and expressed as percentage live weight.

2.4 Determination of Feed Cost

Feed cost was figured by calculating the cost of ingredients and Doum palm pulp used in formulating the diet, by considering individual ingredient cost per Kg (i.e. Price/kg feed = cost per kg of the diet). Cost of feed consumed was determined by multiplying feed intake by cost of feed (₦/kg) i.e. Feed Intake (g) x Cost of Feed (₦/kg). Cost of feed per body weight gain was determined by getting the ratio of the cost of feed consumed and the daily weight gain.

2.5 Proximate Analysis

Samples of the experimental diets were taken to laboratory for proximate analysis where crude protein (CP), crude fibre (CF), ether extracts (EE), nitrogen free extract (NFE) and Ash were determined according to procedures of AOAC (2005).

2.6 Statistical Analysis

Data collected were subjected to analysis of variance at 5% probability level using statistical analysis system (SAS,1999) package. Significantly ($p<0.05$) different means were separated using Fisher's Least Significant Difference (LSD).

3.0 RESULTS AND DISCUSSION

3.1 Results

3.1.1 Performance of Broiler Chickens diets Containing Graded Levels of Doum Palm Pulp Meal Supplemented with Prepared Enzyme

The results of the performance of broiler chickens fed graded levels of Doum palm pulp meal supplemented with prepared enzyme at starter finisher phases are presented in Tables 5and 6, Significant ($p<0.05$) differences exist among all the parameters observed except in the values of initial weight. Final weight (781.23g), weight gain (741.77g/b) and daily weight gain (26.92g/d/b) were significantly ($p<0.05$) higher in T2 (5% DPP). However, chicks fed diet T5 (20% DPP) showed significantly ($p<0.05$) higher values in terms of daily feed intake (52.44 g/b/d) and feed conversion ratio (2.21). Feed cost (₦/kg) and feed consumed ₦/d was higher in T1 (0% DPP).

Table 3: Proximate Composition of the Experimental Broiler Chickens Starter Diets Supplemented with Prepared Enzyme

	Treatments				
Parameters (%)	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**
Moisture	6.01	6.30	6.50	6.76	6.27
Ash	5.82	5.08	5.46	5.43	5.71
Dry matter	94.99	93.70	93.50	93.24	93.73
Ether extract	6.11	6.73	6.34	6.53	6.11
Crude protein	22.99	22.36	22.20	22.28	22.10
Crude fibre	4.30	5.60	5.07	5.83	6.40
Nitrogen free extract	54.78	54.50	52.87	53.14	53.40

Table 4: Proximate Composition of the Experimental Broiler Chickens Finisher Diet Supplemented with Prepared Enzyme (%)

	Treatments				
Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**
Moisture	5.73	5.08	5.80	5.52	5.84
Ash	6.93	6.88	6.05	5.59	6.65
Dry matter	94.27	94.92	94.20	94.48	94.16
Ether extract	5.52	5.73	5.61	5.62	5.56
Crude protein	20.85	20.40	20.22	20.15	20.11
Crude fibre	4.07	5.04	5.44	5.43	5.55
Nitrogen free extract	57.20	56.95	56.89	57.68	56.29

Table 5: **Growth Performance of Broiler Chickens diets Containing Graded Levels of Doum Palm Pulp Meal Supplemented with Prepared Enzyme (0-4weeks)**

Treatments

Parameters	**T1 (0%)**	**T2 (5%)**	**T3 (10%)**	**T4 (15%)**	**T5 (20%)**	**LSD**	**P-value**
Initial weight (g/b/d)	39.33	39.46	39.30	39.33	39.33	0.25	0.63
Final weight(g/b)	724.77^{ab}	781.23^{a}	729.90^{ab}	729.17^{ab}	702.60^{b}	57.31	0.007
Weight gain (g/b)	685.40^{ab}	741.77^{a}	690.60^{ab}	689.83^{ab}	663.27^{b}	57.25	0.007
Daily weight gain (g/b/d)	24.47^{b}	26.92^{a}	24.67^{ab}	24.63^{ab}	23.71^{b}	2.32	0.009
Daily feed intake (g/b/d)	50.83^{c}	51.31^{c}	51.93^{b}	51.91^{b}	52.44^{a}	0.50	0.0003
Feed conversion ratio	2.10^{ab}	1.91^{a}	2.10^{ab}	2.11^{ab}	2.21^{b}	0.20	0.007
Cost of feed (₦/kg)	835.85	746.60	737.40	728.75	719.65	-	-
Cost of feed consumed (₦/d)	42.48	38.31	38.29	37.83	37.74	-	-
Cost of feed/kg weight gain (₦)	1755.28	1426.01	1548.54	1537.66	1590.43	-	-

^{abcd}means with different superscripts within the same row are significantly different (P<0.05). NS= Not significance, LSD= mean significant difference

At finisher phase the results revealed that only daily feed intake was significantly ($p<0.05$) differed across the treatment means. The final weight was higher in T4 (1993.30g) while the least was observed in T5 (1865.70g). A similar pattern was observed in weight gain and daily weight gain as T4 (15% DPP) recorded the highest values (1264.20g and 45.15g/d/b) while T5 recorded the least values (1163.10 and 41.53g/b/d) respectively. FCR was higher in T1 (3.31) while the lowest (2.57) was recorded in T4. Feed cost (₦/kg) and feed consumed ₦/d were higher in treatment one (T1 control).

Table 6: **Performance of Broiler Chickens Fed Diets Containing Graded Levels of Doum Palm Pulp Meal supplemented with prepared Enzyme (Finisher Phase 5- 8 weeks)**

Parameters	T1	T2	T3	T4	T5	LSD	p-value
Initial weight (g/b/d)	724.77	781.23	729.90	729.17	702.60	57.31	0.07
Final Live weight (g/b/)	1908.00	1957.00	1980.30	1993.30	1865.70	299.06	0.86
weight gain (g/b)	1183.20	1175.80	1250.40	1264.20	1163.10	302.05	0.91
Daily weight (g/b/d)	42.23	41.99	44.65	45.15	41.53	10.78	0.91
Daily feed intake (g/b/d)	115.34^{b}	115.58^{b}	116.25^{a}	116.27^{a}	116.53^{a}	0.54	0.002
Feed conversion ratio	2.73	2.75	2.60	2.57	2.80	0.97	0.46
Feed cost (₦/kg)	862.55	762.80	752.65	742.85	733.05	-	-
Cost of feed consumed (₦/d)	99.48	88.16	87.49	86.37	85.42	-	-
Cost of feed/kg weight gain (₦)	2855.04	2105.33	1956.89	1909.12	2177.15	-	-

^{abcd}means with different superscripts within the same row are significantly different ($P<0.05$). NS= Not significant T1 (0%), T2 (5%), T3 (10%). T4 (15%), T5 (20%) LSD= mean significant difference

3.1.2 Carcass Characteristics of Broiler Chickens Fed Diets with Graded Levels of Doum Palm Pulp Meal Supplemented with Prepared Enzyme

The results of carcass characteristics and primal cuts of broiler chickens fed diets containing graded levels of Doum palm pulp meal supplemented with prepared enzyme are presented in Table 7 . From the results, the values of head, wings and neck indicated significant ($p<0.05$) differences while the remaining parameters were not-significantly ($p>0.05$) affected. Significantly ($p<0.05$) higher values of head were observed in T3 (3.50%) while the lowest (2.83%) value was recorded in T5. The value of wings weight in T5 was the lowest (8.51%), which was significantly ($p<0.05$) different from T2 and T3. Treatment one (T1) had the highest value of the neck weight (5.61%) and differed with the remaining treatments.

Table 7: **Carcass Characteristics of Broiler Chickens Fed Diets with Graded Levels of Doum Palm Pulp Meal Supplemented with Prepared Enzyme (%LV wt)**

	Treatments						
Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**LSD**	**p-value**
Live weight (g)	1185.50	1179.00	1120.50	1282.50	1239.00	181.62ns	0.32
Dressed weight (g)	1102.00	1081.50	1155.50	1163.00	1523.00	789.55ns	0.62
Carcass weight (g)	899.00	826.50	879.50	911.00	882.50	131.97ns	0.577
Dressing %	75.83	70.10	78.49	71.03	71.22	6.84ns	0.29
Head (%)	3.33^{ab}	2.97^{bc}	3.50^{a}	3.01^{bc}	2.83^{c}	0.44	0.045
Neck (%)	5.60^{a}	3.80^{b}	4.12^{b}	3.40^{b}	4.11^{b}	1.12	0.024
Breast (%)	20.22	19.79	21.97	21.41	21.82	4.02ns	0.58
Drum stick (%)	11.48	12.90	9.42	12.11	12.35	6.75ns	0.72
Thigh (%)	11.54	8.76	11.43	10.40	10.05	3.01ns	0.25
Back (%)	9.40	7.40	8.23	6.98	6.60	2.78ns	0.21
Thorax (%)	7.62	7.20	8.53	7.22	6.96	1.69ns	0.26
Shanks (%)	5.59	5.05	5.84	5.58	5.45	1.69ns	0.81
Wings (%)	9.07^{ab}	10.93^{a}	10.78^{a}	9.05^{ab}	8.57^{b}	1.90	0.04

^{a,b,c}:means in the same row with different superscripts differ significantly ($p<0.05$). NS= Not significant, LSD = least significant difference. TI (0%), T2 (5%), T3 (10%), T4 (15%), T5 (20%), (%LV wt)= percentage live weight

3.1.3 Visceral Organs Characteristics of Broiler Chickens Fed Diets with Graded Levels of Doum Palm Pulp Meal Supplemented with Prepared Enzyme

The results of the analysis of visceral organs weight (Table 8) in this study indicated only the values of the heart and lungs were significantly ($p<0.05$) affected among the treatment means in all the parameters observed. However, the values of heart weight (0.63%) in T1 was significantly ($p<0.05$) higher and differed from T2 which recorded the least values (0.46%). Significantly ($p<0.05$) higher value of lung (0.80%) was recorded in T1.

Table 8: Visceral Organs Characteristics of Broiler Chickens Fed Diets with Graded Levels of Doum Palm Pulp Meal Supplemented with Prepared Enzyme (% Live weight)

	Treatments						
Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**LSD**	**p-value**
Heart (%)	0.63^{a}	0.46^{b}	0.41^{ab}	0.51^{ab}	0.48^{ab}	0.15	0.017
Lungs (%)	0.80^{a}	0.46^{b}	0.67^{ab}	0.51^{ab}	0.53^{ab}	0.31	0.015
Gizzard (%)	2.76	3.11	3.75	2.61	2.92	1.24	0.28
Kidney (%)	0.25	0.21	0.22	0.15	0.16	0.17	0.63
Proventriculus	0.68	0.93	0.80	0.77	0.75	0.50	0.84
Intestine (%)	6.63	6.07	6.40	5.16	4.72	3.35	0.58

^{a,b,c}: means in the same row with different superscripts differ significantly($p<0.05$) ,NS= Not significant, LSD =least significant difference. TI (0%), T2 (5%), T3 (10%), T4 (15%), T5 (20%)

3.2 Discussion

3.2.1 Performance and feed cost

The results obtained in this study at the starter phase on final weight, weight gain, daily weight gain, and feed conversion ratio were consistent with those of Paul *et al.* (2023). The same authors at the finisher phase reported non-significant ($p>0.05$) differences in the values of final weight, weight gain, and daily weight gain and these values agreed with the results obtained in this study while daily feed intake and feed conversion ratio were reported as significantly ($p<0.05$) affected. These remained consistent with the results of this investigation when they assessed the effects of two milling wastes on the growth performance of broiler chickens with or without enzyme during the finisher period. However, there was a significant ($p<0.05$) reduction in the final weight, weight, gain and daily weight gain on birds fed T5 diet in this study which was in agreement with the result reported by Esonu *et al.* (2004) when they fed 0.10% of enzyme to broiler chickens at finisher phase. More so, the same afore-mentioned parameters in this study were not in agreement with the result reported by Sunmola *et al.* (2019), except in the values of daily feed intake. The author reported higher (86.53g/d) feed intake by the control group as against (71.84-81.63g/d) group fed sweet orange peel meal with enzyme while in this study it was a reverse case, the group received enzyme supplementation had the highest feed intake except for T2 which is similar to the control group. The result was also in agreement with that of Kawu and Shuaibu (2021) who reported a non-significant ($p>0.05$) difference in their study performance and cost-benefit of replacing wheat offal with xylanase-supplemented rice offal in the diets of broiler finisher chickens. The reason for this higher feed intake in the group with prepared enzyme might be as a result of increased level of doum palm pulp meal as its increase resulted in a high fiber level. Oluyemi and Roberts (2000) reported that birds feed more of a higher fiber diet to satisfy their energy requirement. Cost of feed and cost of feed consumed reported by Kawu and Shuaibu (2021) were higher in the control group while the group that received enzyme supplementation recorded lower cost, these was in agreement with the results reported in this study. This cost differences resulted from lower cost of test material (DPP) compared to main energy source (maize) in the control group.

3.2.2 Carcass Characteristics

The non-significant ($p>0.05$) difference observed in this study on carcass parameters except in the values of head and wings were contrary to the results reported by Aguiche and Kehende (2013). The non-significant ($p>0.05$) difference obtained by Afolayan *et al.* (2015) in the values of final weight, dressing percentage, and shanks was in agreement with the results of the said parameters obtained in this study. However, results reported by Shuaibu *et al.* (2021) on carcass characteristics of broiler chickens fed dietary levels of enzyme-supplemented maize offal except for dressing percentage, no carcass parameter was significantly ($p<0.05$) affected corroborate with the findings of this study. Additionally, the non-significant ($p>0.05$) differences observed in the values of live weight, dress weight, dressing percentage, drum stick, and breast reported by Marte *et al.* (2021) were in agreement with findings in this study. The same aforementioned authors revealed results on the heart, liver, lungs, and kidneys contradict with what was reported in this study. However, the significant ($p<0.05$) difference reported by Raji *et al.* (2023) in the values of head, wing, and neck were in agreement with what was reported in this study. Visceral organs observed in this study except for the values of heart were in agreement with the non-significant effect reported by Samuel *et al.* (2019). Similarly, Shuaibu *et al.* (2021) reported non- significant ($p>0.05$) effects in the values of gizzard and kidney are in line with the results reported in this study.

4.0 CONCLUSION AND RECOMMENDATONS

4.1 Conclusion

The study concludes that Doum Palm Pulp Meal with prepared enzyme in the diet of broiler chickens improved growth performance, feed intake, carcass characteristics and reduced cost of feed (₦/kg) of the broiler chickens. Due to its higher nutritional qualities over some conventional feed ingredients, DPPM is considered a potential alternative feed ingredient and can be used at 20% (10/kg of prepared enzyme) levels in the diet of broiler chickens.

4.2 Recommendations

I. Doum Palm Pulp Meal (DPPM) can be included in diets of broiler chickens with enzme at 20% for optimum performance at reduced cost.
II. Further research is recommended using layers as well as other species of poultry.

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