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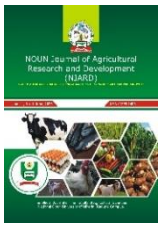

Original Article

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Colocacia esculenta meal based-diet: effect on growth performance, nutrient digestibility and some carcass traits of turkey poults.

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ABSTRACT

70-day feeding trial was carried out to determine the apparent effect of Colocacia esculenta on the growth performance, nutrient digestibility and some carcass traits of turkey poults. Experimental feeds were formulated to meet the dietary/nutritional requirements of the animals. Eighty poults were allocated to five (5) dietary units after brooding for three weeks. Each treatment had a total of sixteen (16) birds with four (4) replicates of four (4) birds per replicate. The experiment was structured in a completely randomized design (CRD). Control treatment (1) had 00% Colocacia esculenta while the rest treatments (2, 3, 4 and 5) had 25, 50, 75 and 100% in that order. The research revealed that some performance traits such as; final weight gain, total weight gain, daily weight gain and daily feed intake were significantly (P<0.05) influenced by the dietary treatments. Total feed intake and feed conversion ratio did not show significant (P>0.05) difference. Results from the digestibility trial depicts that dry matter, crude protein, crude fibre and ether extract were significantly (P<0.05) affected. Dry matter digestibility was better in control treatment and treatment 5 with 100% Colocacia esculenta. Ash and ether extract were not significantly (P>0.05) influenced but showed close statistical values. All the assayed carcass profiles such as bled/slaughter weight, defeathered weight, eviscerated weight and dressing percentage indicated significant (P<0.05) difference. The findings of this research explicitly revealed that Colocacia esculenta meal could replace maize with better performance at 50% level and maintain digestibility and carcass traits of turkey poults.

***Keywords:** Colocacia esculenta, turkey poults, maize replacement, carcass traits, nutrient digestibility.*

INTRODUCTION

The rising population growth in Africa and Nigeria in particular will require deliberate and aggressive agricultural revolution if the threatening food insecurity starring the country must be addressed. No doubt that animal agriculture contributes immensely to the gross domestic product (GDP) of nations of the world (Iwegbu, *et al.,* 2023). There is a widening gap (shortage) between the protein supply and the actual body requirements in most developing countries. This makes the country and her citizens vulnerable to the threat of food insecurity that may lead to acute malnutrition and poor productivity. Ekuagbere *et al*., (2018) reported that in many developed nations, farm animal production contributes greatly to the gross domestic product (GDP) and enhance standard of living. James, (2000) and Igene *et al*., (2007) in their separate report pointed out that of all livestock with the capability of closing the gap; only poultry has the immediate ability to generate result at shortest possible time due to its high level of feed conversion ratio and growth. Atteh (2004) stated that concern in poultry and its products was as a result of high quality nutrients (proteins, minerals and vitamins) to balance the human diet. Nigeria, with about two hundred (200) million human population

(Worldometer, 2022), is in dire need of animal protein to maintain health and reproduction.

Livestock feed and feeding remain a herculean challenge to the growth and development of the industry. Hence conventional animal feed ingredients are the same as human; it therefore becomes imperative to come up with feed ingredients that man has no direct consumption, available and relatively cheap to source. Over the years, appreciable breakthroughs have been achieved on the use of agricultural by-products for farm animals thereby mitigating the pressure on direct conventional feed ingredients. Agro by-products such as palm kernel meal, cassava peel meal, brewer's dried grain etc have evolved and are used as basal energy sources in the growing of both ruminant and non-ruminant animals. Little or nothing is however known about the use of *Colocacia esculenta* (taro cocoyam) as a nutritional basal energy source in the growing of turkey poults. The ingredient is a cheap source of calorie and discovered to be readily digestible (Agwunobi, *et al*., 2002). Given the high proximate composition of experimental ingredient as reported by Ajetunmobi, *et al*., (2019) and Fufa *et al*., (2023), it therefore becomes imperative to determine its effect on growth performance, nutrient digestibility and some carcass traits of turkey poults.

Tabble 1: NUTRIENT COMPOSITION OF MAIZE AND *COLOCASIA ESCULENTA*

Nutrient %	Maize	*Colocasia esculenta*
Dry matter	89.80	87.62
Crude protein	8.94	7.87
Crude fibre	2.76	4.57
Ether extract	4.34	0.76
Crude ash	2.01	6.05
NFE	71.75	68.37
Carbohydrate	26.54	45.06
ME (kcal/kg)	3325.42	3214.91

*Ajetunmobi *et al.,* (2019)

*NFE: nitrogen free extract; ME; metabolizable energy

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MATERIALS AND METHODS

Study Site: The seventy-day (70) feeding trial was undertaken at the University of Delta Poultry Unit of the Teaching and Research Farm of the Faculty of Agriculture. The University is situated in Ika South Local Government Area of Delta State, Nigeria. Hector *et al*., (2017) reported that the climate in the study area showed characteristics that are in line with sub-equatorial climate having an annual average temperature of 27^{oC} and a mean annual rainfall of 2255mm.

Sourcing of Experimental Materials and Preparation

Colocacia esculenta tubers used for the experiment were purchased in an open village market in Ekpoma, Edo State, Nigeria. The tubers were cut into smaller pieces and thereafter heat-treated (parboiled) for about twenty minutes before removing the water. They were placed in an open space to air-dry overnight and later sundried for 15 days to bring down the moisture level to about 9%. The ingredient (cassava) was treated thus; peeled, chopped into pieces and sundried for 3 weeks to ensure that anti-nutritional elements are reduced to the barest minimum. The experimental ingredient and other accompanying feed ingredients were separately milled and properly packaged in an air-tight cellophane bag in readiness for use.

Experimental Birds and Design

Three cartons of day-old exotic turkey poults amounting to ninety (90) were bought from a notable hatchery in Ibadan, Oyo State, Nigeria. They were brooded for three weeks using conventional (commercial) feed. Thereafter eighty (80) of them (brooded poults) were allocated to five (5) experimental diets. Each dietary treatment had a total of sixteen (16) birds with four (4) replicates of four (4) birds each. Experimental poults were managed in a deep litter system with wood shavings serving as litter material. Five days to the arrival of the poults, the house was properly cleaned and disinfected while the surroundings were cleared to make sure that dangerous animals are ward off. The experiment was structured in a completely randomized design (CRD). Animals had unlimited access (*ad libitum*) to experimental feed and water throughout the 70-day feeding trial. Feeds were placed half way in the feeders to avoid wastage by the birds while the leftover feed were often stirred with hand to prevent caking before new ones were added. Droppings from birds and wood shavings in water were removed to ensure clean, hygienic and acceptable water. The control treatment (1) had 100% maize while the rest treatments (2, 3, 4 and 5) had 25, 50, 75 and 100% in that order as replacement for maize.

Performance study

Traits examined on the performance study include weekly feed intake, weekly weight gain and feed conversion ratio (FCR). Weekly feed intake was assessed by weighing the quantity of feed given daily and subtracting the remnant the following morning. The information obtained on the daily feed consumed was used to compute the average weekly feed consumed. Similarly, weekly weight gain was calculated as the difference in the weight at the beginning of the week and weight recorded at the end of the week. The poults were weighed using 20 Top-Pan scale while the feed conversion ratio was calculated as the ratio of feed intake to weight gain (g).

$$\text{Feed conversion ratio (FRC)} == \frac{\text{Feed Consumed (g)}}{\text{Weight gain (g)}}$$

Table 2: Composition of the Experimental Feed for Turkey Poults

	Inclusion Levels of *Colocacia esculenta*				
Ingredients %	Diet 1 (0)	Diet 2 (25)	Diet 3 (50)	Diet 4 (75)	Diet 5 (100)
Maize	46.00	34.50	23.00	11.50	0.00
Colocacia esculenta meal	0.00	11.50	23.00	34.50	46.00
Cassava	15.00	15.00	15.00	15.00	15.00
Soybean meal	20.00	20.00	20.00	20.00	20.00
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Bone meal	2.75	2.75	2.75	2.75	2.75
Vit/min premix	0.50	0.50	0.50	0.50	0.50
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
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 %	26.74	26.78	27.01	27.04	27.41
ME (Kcal/kg)	3362.44	3370.03	3385.21	3404.04	3413.05
Crude fibre	10.10	9.65.	9.64	8.78	8.86
Dry matter	87.03	87.23	87.71	90.01	90.58
Ether extract	4.63	4.78	5.42	5.46	5.54
Ash	11.32	11.30	12.36	12.71	12.72
NFE	46.72	45.43	45.55	44.73	44.87

. *ME= metabolizable energy; NFE=nitrogen free extract; Vit=vitamin; Min=mineral; Kg=kilogram; Kcal=kilocalorics.

Nutrient digestibility study

On the sixty-fourth day of the feeding trial, one poult per replicate was randomly selected and kept in metabolic cages for the last period (7 days) of the experiment. They were given two days of adaptation period before the experimental diets were administered. This was followed by faecal collection. Faeces voided were sun-dried and later oven-dried while representative samples were taken for chemical analysis in accordance with A.O.A.C (1990). Nutrient digestibility was calculated as:

$$\frac{\text{Nutrient in feed taken} - \text{Nutrient in faeces passed}}{\text{Nutrient in feed taken}} \times \frac{100}{1}$$

Dressing percentage of the poults was expressed as the percentage ratio of the eviscerated weight to live weight. Thus:

$$\text{Dressing percentage (\%)} = \frac{\text{Eviscerated weight}}{\text{Live weight}} \times \frac{100}{1}$$

Statistical Analysis

The collated data were analyzed using analysis of variance (ANOVA) to determine the significance of treatment as described by SAS (1997) while Ducan Multiple Range Test was used to separate the means.

RESULT AND DISCUSSION

Table 3: Growth Characteristics of Turkey Poults as Affected by the Treatment Diets.

	Levels of addition of *Colocacia esculenta*					
Parameters %	Diet 1 (0)	Diet 2 (25)	Diet 3 (50)	Diet 4 (75)	Diet 5 (100)	SEM (±)
Mean initial weight (g/bird)	233.53	233.06	232.76	232.85	233.96	
Mean final weight (g/bird)	4435.53^{b}	4466.00^{b}	4864.11^{a}	4701.77^{a}	4656.11^{ab}	4.11
Mean total weight gain (g/bird)	4022.00^{d}	4282.94^{c}	4631.35^{a}	4468.92^{b}	4422.09^{b}	5.01
Mean daily weight gain (g/bird)	57.46^{d}	61.18^{c}	66.16^{a}	63.84^{b}	63.17^{b}	4.17
Mean total feed intake (g/bird)	11541.47	12335.44	12270.98	12283.00	12041.70	3.89
Mean daily feed intake (g/bird)	164.88^{d}	176.22^{a}	175.30^{b}	175.47^{b}	172.02^{c}	3.09
Feed conversion ratio	2.60	2.88	2.65	2.75	2.72	1.06

* Means within the same row with different superscripts are significantly different (P<0.05)

Result on performance characteristics of turkey poults fed the experimental diets is presented in the Table (3) above. It clearly depicts significant (P<0.05) differences on the mean final weight, mean total weight gain, mean daily weight gain and mean daily feed intake (g/bird). The findings on this research corroborates with the report of Ajetunmobi, *et al*., (2019) who observed that experimental diets 3, 4 and 5 with the same level of inclusion were better (more significant) in pigs. Though, this research centered on turkey poults, its result on final weight, total weight and daily weight (mean) suggested that they were positively influenced by the dietary treatments. This may be traceable to the high carbohydrate (45%) level as reported by Ajetunmobi, *et al*., (2019). In further comparison with the control diet (1); total weight gain was superior at 50% inclusion which may be due to high feed intake and better

utilization by the birds which translated to better live weight gain. Daily weight gain also followed the same trend as total live weight. Value (66.16g/bird) obtained for 50% inclusion level proved better than the value (57.46) for the control diet. The finding of Abdulrahid and Agwunobi (2009) is at variance with the result of this research but agreed with the report of Vulla *et al.,* (2025). They reported no significant (P>0.05) difference in the total weight gain of broilers that were placed on taro cocoyam *Colocacia esculenta* meal base diet. Animals placed on experimental treatments were better consumers of feed than those in treatment 1. Values ranging from 12041.70 to 2335.44 g/bird (diets 5 and 2 respectively) were recorded for total feed intake. This parameter revealed that the result was not dose affected as it recorded that diet 2 (25% inclusion) had the highest value (2335.44g/bird) against diet 5 (100% inclusion). Though feed conversion ratio (FCR) was not significantly (P>0.05) affected, it could be said that it is technically better at dietary treatment 3 with 2.65.

Table 4: Nutrient digestibility of turkey poults as Influenced by the dietary treatment.

	Levels of addition of *Colocacia esculenta*					
Parameters %	Diet 1 (0)	Diet 2 (25)	Diet 3 (50)	Diet 4 (75)	Diet 5 (100)	SEM (±)
Dry matter digestibility	88.74^{a}	85.31^{c}	86.64^{b}	86.72^{b}	87.61^{a}	3.36
Crude protein digestibility	78.34^{d}	81.42^{c}	89.74^{a}	87.03^{b}	88.60^{b}	4.45
Crude fibre digestibility	43.44^{e}	50.28^{d}	53.00^{c}	55.44^{b}	59.40^{a}	2.18
Ether extract digestibility	37.06^{c}	45.53^{b}	48.30^{a}	48.40^{a}	48.17^{a}	3.46
Ash digestibility	16.46	15.68	16.44	15.97	15.88	2.26
Nitrogen free extract	4.65	4.46	5.01	5.49	5.73	3.01

* Means within the same row with different superscripts are significantly different (P<0.05)

The above Table (4) shows the results of the nutrient digestibility trial of turkey poults fed the experimental ingredient. Some of the assayed parameters (dry matter, crude protein, crude fibre and ether extract) revealed varied levels of significant (P<0.05) difference while others (ash and nitrogen free extract) were not significantly (P<0.05) affected by the treatment diets. Dry matter digestibility was highest at the opposing sides (control diet and 100% inclusion) of the dietary treatments with 88.74% and 87.61% respectively. Crude protein digestibility was significantly (P<0.05) higher in 50% inclusion level when compared with the control diet. This could be said to have aided better live weight of the animals in this treatment as evident in the performance Table (3). Crude fibre digestibility was significantly (P<0.05) higher in treatment 5 with 100% *Colocacia esculenta* inclusion. The value (59.40%) surpasses the obtained value (43.44%) for maize based control diet. This may be traceable to higher crude fibre of *Colocacia esculenta* (4.57) in Table 1 which may have resulted in better crude fibre digestibility. There is a near dose related increment in the obtained record for ether extract. This ranges from 45.53% in treatment 2 (25% inclusion) to 48.40% in treatment 4 (75% inclusion). Report on this parameter is in tandem with the findings of Abdulrahid and Agwunobi (2009) and Iwegbu *et al.* (2022). The ether extract was lowest 37.06% in the control diet (1). There were no significant (P>0.05) differences for ash and nitrogen free extract digestibility though each of the parameters varied statistical values.

Table 5: Some Carcass Profile of Turkey Poults as Affected by the Dietary Treatment.

	Levels of addition of *Colocacia esculenta*					
Parameters %	Diet 1 (0)	Diet 2 (25)	Diet 3 (50)	Diet 4 (75)	Diet 5 (100)	SEM (±)
Final live weight (g/bird)	4435.53^{b}	4466.00^{b}	4864.11^{a}	4701.77^{a}	4656.11^{ab}	4.03
Bled/slaughter weight	4343.61^{c}	4368.32^{c}	4761.19^{a}	4609.03^{b}	4563.21^{b}	2.82
Defeathered weight	4171.62^{c}	4143.32^{c}	4552.12^{a}	4531.05^{a}	4327.07^{b}	4.42
Eviscerated weight	3782.53^{c}	3751.21^{c}	4161.02^{a}	4160.60^{a}	4042.33^{b}	3.67
Dressing %	85.28^{b}	84.00^{c}	85.55^{b}	86.38^{a}	86.82^{a}	3.66

* Means within the same row with different superscripts are significantly different (P<0.05)

Carcass traits of turkey poults fed various levels of *Colocacia esculenta* meal base diet is presented in Table 5. Values for bled/slaughter of the experimental animals were statistically the same and lowest in the control treatment and treatment 2. This parameter proved better (4761.19) with the inclusion of 50% *Colocacia esculenta* followed by the performance of birds in diets 4 and 5 (4609.03 and 4563.21). Defeathered carcass weight was significantly (P<0.05) affected across the five treatments. The recorded weights were superior at diets 3 and 4 followed by diet 5 were least in diets 1 and 2. The same trend played out in the eviscerated weights of the experimental animals and could be adjudged not to have dose effect. Dressing percentage revealed that treatments 4 and 5 were better compared to the control diet.

CONCLUSION

It could be concluded from the revelation of this research that *Colocacia esculenta* base-diet could replace maize with better growth performance at 50% level of inclusion and maintain good digestibility and carcass traits of turkey poults.

RECOMMENDATION

It is hereby recommended thus;

a) That this experimental ingredient be carried out on other non-ruminant animals such as pig and rabbit.

b) that turkey producers should be encouraged to incorporate *Colocacia esculenta* meal in the diets their poults to enhance better growth performance.

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