PROSPECT OF FOWL EGGS AS A REPLACEMENT FOR ESSENTIAL AMINO ACID IN POULTRY NUTRITION

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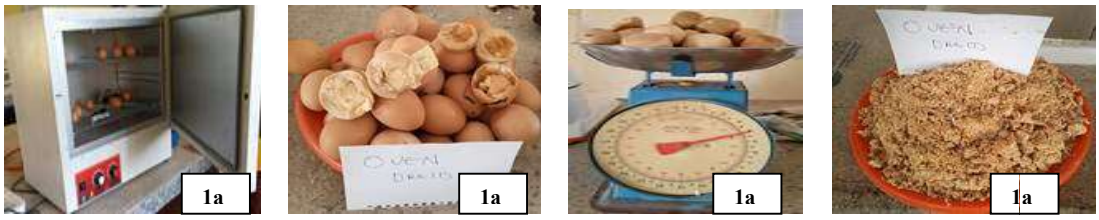
Abstract
The study was undertaken to determine the prospect of fowl eggs as a possible replacement for essential amino acid in poultry nutrition. Ten creates of fowl eggs were purchased and used for the experiment. The eggs were boiled, dried and included in formulated feed designated as oven dried, frozen, solar dried and kiln dried representing T3, T4, T5 and T6, respectively. Commercial feed was designated as control I (T1) while T2 feed was formulated without fowl eggs to serve as control II. All the feed samples were collected and processed for proximate and phytochemical components. Results revealed that ash (6.55 – 13.81%), ether extract (10.46 – 13.96%) and carbohydrate (52.22 – 75.68%) were boosted in the feeds containing fowl eggs compared to 5.7 - 7.67% (ash), 7.5 – 8.10% (ether extract) and 45.0 – 48.86% (carbohydrate) recorded in the control feeds more importantly, the crude protein values were 20.75% and 18.13% in formulated feeds containing oven and kiln dried eggs, respectively while T2 (3.52%) without fowl eggs, T4 (10.13%) with frozen boiled fowl eggs and T5 (11.38%) with solar dried fowl eggs were comparatively lower. Consequently, drying fowl eggs could improve the nutritional quality hence, the potentials and prospects in poultry nutrition.

Introduction
Protein provides the amino acids for tissue growth and egg production. The dietary protein and amino acids requirements of poultry birds are influenced by age, egg production and metabolizable energy content and the ingredients used to formulate the diets. The type of protein to be fed to birds must be provided from a high quality source. Protein quality is generally based on amino acid composition of the feedstuff and the bioavailability of these amino acids from the feedstuff following digestion in the gut. Amino acids are considered as the building blocks of proteins (Babangida and Ubosi, 2006). Out of 19 total amino acids required by birds, 13 are considered as essential because they cannot be produced in the body and must be supplied in the diets. Six are considered as nonessential, because they could be synthesized by the body and need not be supplied in the diets. According to Murakami *et al*. (1993), the 13 essential amino acids are basically arginine, cystine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, tyrosine and valine. These amino acids have been detected in fowl eggs (WIKIPEDIA 2016a; b) hence the potentials and prospects in poultry nutrition. Poultry birds require quality proteins to thrive and perform optimally hence, the need for dietary protein to provide the essential amino acids. Plant protein may not be enough to achieve this feat thus, animal protein supplementation is imperative. Many animal related products and by-products have been utilised in livestock

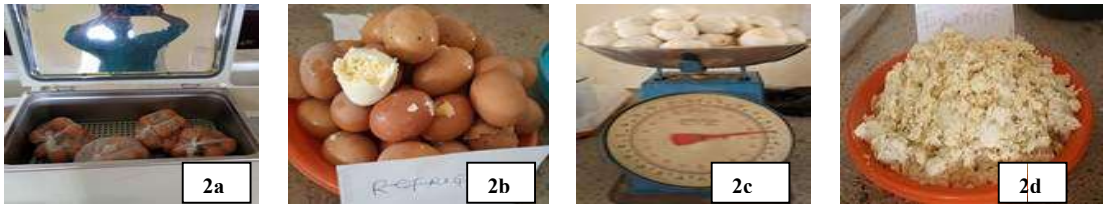
feeding. During glut, fowl eggs are often destroyed yet little is known about the use of fowl eggs in poultry nutrition hence the present study.

Materials and Materials

The study was conducted in Animal Science Laboratory, Nasarawa State University Keffi, Shabu-Lafia Campus. Ten creates of fowl eggs were obtained from the Poultry Division, National Veterinary Research Institute, Vom Plateau State. The eggs were weighed and boiled for 30 minutes in cellophane to avoid cracking. Thirty each of the boiled fowl eggs were oven dried, frozen, solar dried, kiln dried and designated as T3, T4, T5 and T6, respectively (see plates 1 - 4). The dried fowl eggs were grated using plastic grater to crumbs, mixed properly with other feedstuffs, milled and labelled appropriately. Commercial feed (control I) was acquired from the market and was designated as T1 while T2 feed that served as control II was formulated without fowl eggs. Soyabean and sorghum meals were collected from "soybean milk" and "kunu" cottage centres and were used with fish meal and salt in formulating the feeds as shown in table 1. Samples of the formulated feeds were processed for proximate and phytochemical analyses following standard procedures (AOAC, 1990; Ramteke *et al*., 2019).



T3: Plates 1a, b, c and d: Boiled, oven dried and crushed fowl eggs



T4: Plates 2a, b, c and d: Boiled, refrigerated and crushed fowl eggs

T5: Plates 3a, b, c and d: Boiled, solar dried and crushed fowl eggs

T6: Plates 4a, b, c and d: Boiled, kiln dried and crushed fowl eggs

Results and Discussion

Table 1 shows feed formulated with differently processed fowl eggs. Soyabean, sorghum offal, fowl eggs, fish meal and salt were used in formulating the feed meant for Japanese quails. However, because T1 was a commercial feed serving as control I, the feedstuffs used in the formulation were not known and T2 serving as control II, was formulated without fowl eggs. The processed fowl eggs inclusion levels in the feeds, ranged from 7.83 – 10.00% which is some what affordable thus, could be utilised in feed formulation if the need arises.

Table 1: Feed formulated with differently processed fowl eggs

Feedstuffs (%)	Formulated feed					
	T1	T2	T3	T4	T5	T6
Soyabean	NK	30.41	28.00	27.87	27.36	27.74
Sorghum offal	NK	68.94	63.45	63.17	62.00	62.87
Egg	NK	0.00	7.93	8.35	10.00	8.78
Fish meal	NK	0.35	0.35	0.33	0.35	0.33
Salt	NK	0.30	0.27	0.28	0.29	0.28
Total		100	100	100	100	100

T1 (control): Commercial feed; T2 (control): Formulated feed without fowl eggs; T3: Formulated feed with oven dried fowl eggs; T4: Formulated
feed with frozen boiled fowl eggs; T5: Formulated feed with solar dried fowl eggs; T6: Formulated feed with kiln dried fowl eggs; NK: Not known.

Presented in table 2 is the nutritional quality of feed formulated with differently processed fowl eggs. The values of the nutrients declared and determined in T1 were similar, indicating that the commercial feed was of high quality and have probably complied with the regulations of Nigerian Institute of Animal Science Act No. 26 of 2007. The crude protein values were 20.75% and 18.13% in the formulated feeds containing oven and kiln dried eggs, respectively. Whereas, T2 (3.52%) without fowl eggs, T4 (10.13%) with frozen boiled fowl eggs and T5 (11.38%) with solar dried fowl eggs were comparatively lower. Similarly, the ash (6.55 – 13.81%), ether extract (10.46 – 13.96%) and carbohydrate (52.22 – 75.68%) were boosted in the feeds containing fowl eggs compared to 5.7 - 7.67% (ash), 7.5 – 8.10% (ether extract) and 45.0 – 48.86% (carbohydrate) recorded in the control (T1 and T2) feeds.

This observation seemingly signified that oven and kiln drying techniques, may improve the nutritional quality of fowl eggs. Essentially, oven and kiln drying of fowl eggs boosted the crude protein to a range of 17 to 20% recommended for quail production (Bawa *et al.*, 2011; Babangida and Ubosi, 2006). It was observed that the crude fibre was within 6.23% (T2) and 6.45% (T3) compared to 6.4% declared in the commercial feed. This implied that fowl eggs possibly do not contain fibrous materials. Nevertheless, the crude fibre values in all the feeds (including the commercial feed), were lower than 18% recommended in Japanese quails to enhance feed digestion and nutrients utilisation (Nworgu *et al.*, 2012). Consequently, during glut, fowl eggs should no longer be destroyed rather processed and incorporated in poultry feeds.

Table 2: Nutritional quality of feed formulated with differently processed fowl eggs

Nutrients (%)	T1		T2	T3	T4	T5	T6
	Declared	Determined					
Moisture	7.50	7.57	7.40	6.79	10.27	7.85	6.92
Ash	5.70	5.68	7.67	8.57	13.81	6.55	8.74
Crude protein	25.0	26.25	3.52	20.75	10.13	11.38	18.13
Ether extract	7.50	7.89	8.10	13.02	10.46	13.51	13.96
Crude fibre	6.40	7.59	6.23	6.45	6.38	6.24	6.34
Carbohydrate	45.0	45.02	48.86	62.77	52.22	53.91	75.68

T1 (control): Commercial feed; T2 (control): Formulated feed without fowl eggs; T3: Formulated feed with oven dried fowl eggs;
T4: Formulated feed with frozen boiled fowl eggs; T5: Formulated feed with solar dried fowl eggs; T6: Formulated feed with kiln dried fowl eggs.

The phytochemical constituents of feed formulated with differently processed fowl eggs are shown in table 3. It was observed that tannins and glycosides were absolutely absent whereas, flavonoids were present in all the feeds samples evaluated. In the same trend, oxalates were present in all the feeds samples except T2 that was negative. Saponins were present in T3 and T5 and alkaloids were only recorded in T3. Since phytochemicals are natural metabolites in plants, saponins, flavonoids, alkaloids, glycosides and oxalates are bound to be found in formulated feeds particularly if not properly processed. Soetan and Oyewole (2009) stressed the need for adequate processing to reduce the anti-nutritional factors in plants used as human foods and animal feeds. This observation corroborates the reports of Ramteke et al. (2019) that antinutritional factors were found in feed and fodder used for livestock and poultry feeding. However, they could be tolerated by some poultry species therefore, sorghum and soybean meals could be utilised in poultry nutrition.

Table 3: Phytochemical constituents of feed formulated with differently processed fowl eggs

Phytochemicals	T1	T2	T3	T4	T5	T6
Tannins	-	-	-	-	-	-
Saponins	-	-	+	-	+	-
Flavonoids	+	+	+	+	+	+
Alkaloids	-	-	+	-	-	-
Glycosides	-	-	-	-	-	-
Oxalates	+	-	+	+	+	+

T1 (control): Commercial feed; T2 (control): Formulated feed without fowl eggs; T3: Formulated feed with oven dried fowl eggs; T4: Formulated
feed with frozen boiled fowl eggs; T5: Formulated feed with solar dried fowl eggs; T6: Formulated feed with kiln dried fowl eggs; +: Present; -: Absent

Conclusion

Feed samples containing differently processed fowl eggs, salt, fish, soyabean and sorghum meals, contained similar nutrients that were determined in the commercial feed sample. It was observed that the feeds samples containing oven and kiln dried fowl eggs had better nutritional quality. Some phytochemicals were recorded in all the feeds samples including the

commercial feed. Therefore, dried fowl eggs could be incorporated in diets meant for poultry species as a possible replacement for essential amino acid.

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