

Performance of Broiler Chickens Fed Roasted or Soaked Undecorticated Baobab (*Adansonia Digitata*) Seed Based Diets

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Abstract

Food poisoning caused by plant secondary metabolites, also known as anti-nutritional factors (ANFs), remains a significant issue in Nigeria and many other developing countries. It is crucial to continue monitoring and researching methods to mitigate the effects of these anti-nutritional factors in plants used as feedstuffs such as *Adansonia digitata*. The objective of the study was to investigate the effects of soaked and roasted undecorticated *Adansonia digitata* seed meal (UADSM) on performance of broiler chickens. A total number of 196 1-day-old Ross 308 broiler chicks were randomly assigned to seven dietary treatments containing varying levels (0, 10, 12.5, and 15%) of processed undecorticated *Adansonia digitata* seeds through soaking and roasting methods for a period of six weeks. Through data collection on performance characteristics (Initial body weight, Final body weight, weight gain, feed intake and feed conversion ratio). Parameters such as final weight, weight gain and feed intake were significantly different ($p \leq 0.05$). T4 (15% roasted UADSM) recorded the highest final weight. The highest weight gain was observed in T4 (15% roasted UADSM) and T7 (15% soaked UADSM), T4 also recorded the highest feed intake and the lowest feed conversion ratio which was the best. It was observed that processed UADSM up to 15% had no adverse effects on the broiler chickens. Roasting and soaking are effective processing methods to enhance the utilization of *Adansonia digitata* seed meal. Our findings point out the potential of UADSM at 15% inclusion level for optimal broiler performance. It is recommended that further research can adopt other processing methods besides roasting and soaking in mitigating the effects of antinutritional factors present in *Adansonia digitata* seed meal in order to improve its utilization in broiler diets.

Keywords: Antinutritional factors, undecorticated, *Adansonia digitata* seed meal.

Performance Des Poulets De Chair Nourris Avec Des Régimes A Base De Graines De Baobab (*Adansonia Digitata*) Non Décortiquées Et Traitées Par Torréfaction Ou Trempage



Résumé

Les intoxications alimentaires causées par les métabolites secondaires des plantes, également appelés facteurs anti-nutritionnels (FAN), restent un problème majeur au Nigeria et dans de nombreux autres pays en développement. Il est essentiel de poursuivre la surveillance et la recherche de méthodes pour atténuer les effets de ces facteurs anti-nutritionnels dans les plantes utilisées comme aliments pour animaux, telles que *Adansonia digitata*. L'objectif de cette étude était d'évaluer les effets de la farine de graines non décortiquées de *Adansonia digitata* (UADSM) traitée par trempage ou torréfaction sur les performances des poulets de chair. Au total, 196 poussins de chair Ross 308 âgés d'un jour ont été répartis aléatoirement en sept régimes alimentaires contenant différents niveaux (0 %, 10 %, 12,5 % et 15 %) de graines non décortiquées de *Adansonia digitata* traitées par trempage ou torréfaction, pendant une période de six semaines. Les données sur les caractéristiques de performance (poids vif initial, poids vif final, gain de poids, consommation alimentaire et indice de conversion alimentaire) ont été recueillies. Les paramètres tels que le poids final, le gain de poids et la consommation alimentaire ont présenté des différences significatives ($p=0,05$). Le traitement T4 (15 % UADSM torréfiée) a enregistré le poids final le plus élevé.

Les gains de poids les plus importants ont été observés dans les traitements T4 (15 % UADSM torréfiée) et T7 (15 % UADSM trempée). Le traitement T4 a également présenté la consommation alimentaire la plus élevée et le meilleur indice de conversion alimentaire. Il a été constaté que l'UADSM traitée jusqu'à 15 % n'avait pas d'effets néfastes sur les poulets de chair. La torréfaction et le trempage sont des méthodes de traitement efficaces pour améliorer l'utilisation de la farine de graines de Adansonia digitata. Nos résultats mettent en évidence le potentiel de l'UADSM à un niveau d'incorporation de 15 % pour des performances optimales des poulets de chair. Il est recommandé que des recherches ultérieures explorent d'autres méthodes de traitement, en plus de la torréfaction et du trempage, afin de réduire les effets des facteurs anti-nutritionnels présents dans la farine de graines de Adansonia digitata et d'améliorer son utilisation dans les régimes alimentaires des poulets de chair.

Mots-clés : Facteurs anti-nutritionnels, non décortiqué, farine de graines de *Adansonia digitata*.

Introduction

Food poisoning arising from plant secondary metabolites, otherwise known as anti-nutritional factors, other than cyanogenic glycosides, has not been properly addressed in Nigeria, and indeed in most parts of the developing countries, that depend mostly on vegetable-based diets. People have therefore died out of ignorance, poverty and inadequate nutritional education, especially within the African societies (Igile, 1996; Soetan and Oyewole, 2009). The anti-nutritional factors (ANF's) may be defined as those substances generated in natural food stuffs by the normal metabolism of species and by different mechanisms (e.g. inactivation of some nutrients, diminution of the digestive process, or metabolic utilization of feed) which exert effects contrary to optimum nutrition (Kumar, 1992). Being an ANF is not an intrinsic characteristic of a compound but depends upon the digestive process of the ingesting animal (Kumar, 1992). For example, trypsin inhibitors, which are ANFs for monogastric animals, do not exert adverse effects in ruminants because they are degraded in the rumen (Cheeke and Shull, 1985). The utility of the leaves, pods and edible twigs of shrubs and trees as animal feed is limited by the presence of ANFs (Kumar, 1992). Much of the available data and information on the nutrient and anti-nutrient composition of the more commonly used local foods and feeds do not cover all the foods and feeds and where available, needs updating. This

is because of the possible effects of variety/genetic origin, climate, soil, processing methods, pesticides and fertilizers on the chemical composition of the food plants (Soetan and Oyewole, 2009).

Soetan and Oyewole (2009) stated that several considerations justify the continued surveillance, knowledge and future research on antinutritional factors naturally present in plants used as feedstuffs and ways of reducing them to safe level of consumption.

Information on the effect of different processing techniques on the anti-nutritional factors in human foods and animal feeds will attract interests by human and animal nutritionists, dieticians, veterinarians, public health and food regulatory bodies on the exploitation of these techniques so that the nutritive values of foods and feeds could be efficiently maximized (Soetan and Oyewole, 2009). Although data on the necessary optimal processing techniques, if any, is scanty, this should be established to ensure optimal utilization of human foods and animal feeds.

A. digitata is a multipurpose tree species mostly used for medicine, food, fodder and clothing as well as raw material for many useful items. The fruit pulp is dried and used in cold and hot drinks. The fruit pulp can dissolve in water and milk, and the liquid is used as a drink and sauce for food and as a fermentation agent in local brewing. The fruit pulp of baobab is very rich in vitamin C,

calcium, phosphorus, carbohydrates and soluble and insoluble fibres. The worldwide demand of baobab has increased dramatically in more sectors, such as the medical industry, food industry and cosmetic industry. In reality, due to its pharmacological properties, the whole plant is used for the multiple medicinal purposes in many parts of Africa (Rahul *et al.*, 2015). The acceptability and optimal utilization of baobab parts especially seed are limited by the presence of antinutritional factors such as saponin, tannins, phytic acid, amylase inhibitors and trypsin inhibitors. It is known that processing techniques may cause a loss of some nutrients in food items. However, processing may enhance food nutritional quality by mitigating, or destroying the antinutrients present in it (Kabore *et al.*, 2011).

The objective of the study was to investigate the effects of processed by soaking and roasting undecorticated *Adansonia digitata* seed on performance of broiler chickens.

Materials and Methods

Site of Experiment

The experiment was carried out on a private farm at Government Reserved Area, Ilorin, Kwara State.

Processing of *Adansonia digitata* seed

The test ingredient (*Adansonia digitata*) was obtained from Ogbomosho town of Oyo state, Nigeria. The fruits were harvested and the seed manually separated from the pulp, the seeds were washed in ordinary water to completely get rid of the pulp. A portion of the seed (125kg) was soaked in ordinary water with the seeds submersed for 48hrs, sun dried for about 96hours till it was dry enough to be milled and hammer milled for inclusion in the diet at varying levels of 10, 12.5 and 15% respectively. While the other portion of the seed (125kg) was roasted at 60°C for 1hour and turning occurred every 5mins, it was then left to cool off before it was hammer

milled for inclusion in the diet at varying levels of 10, 12.5 and 15% respectively.

Experimental Diets, Animals and Feeding Experiment

The experiment was a completely randomized design. A total number of 196 1-day old Ross 308 broiler chicks were used for the experiment and were randomly assigned to seven dietary treatments replicated four times with seven birds in each replicate. The formulated diet was used all through the experiment as the starter and finisher diet. Feed and water were provided *ad-libitum* for a period of 6weeks.

- T1 -control (0% ADSM)
- T2 - 10% roasted *Adansonia digitata* seed meal (RADSM)
- T3 - 12.5% roasted *Adansonia digitata* seed meal (RADSM)
- T4 - 15% roasted *Adansonia digitata* seed meal (RADSM)
- T5 - 10% soaked *Adansonia digitata* seed meal (SADSM)
- T6 - 12.5% soaked *Adansonia digitata* seed meal (SADSM)
- T7 - 15% soaked *Adansonia digitata* seed meal (SADSM)

Data Collection and Statistical Analysis

In the course of the experiment feed intake, weight gain and feed conversion ratio data was obtained. Feed was weighed out to the animals weekly and residue was also weighed in order to estimate feed consumed. Weekly body weight of the broiler chicken was taken using a weighing scale. Weight gain was calculated by deducting the initial from the final weight of birds. Feed conversion ratio was calculated as a ratio of feed consumed to weight gained. Proximate analysis of feed samples was carried out according to the method of AOAC 2000.

All data obtained were subjected to analysis of variance using the model for a completely randomised design of SAS package (2000). Significant means were analysed used the same package.

Table 1: Diet Composition of experimental diet:

Ingredients	Control (T1)	T2	T3	T4	T5	T6	T7
Maize	55	55	55	55	55	55	55
Soya bean meal	37	37	37	37	37	37	37
Roasted undecorticated Adansonia digitata seed meal	0	10.0	12.5	15.0	0	0	0
Soaked undecorticated Adansonia digitata seed meal	0	0	0	0	10.0	12.5	15.0
Wheat Offal	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Fish Meal	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Oyster Shell	1.5	1.5	1.5	1.5	1.5	1.5	1.25
Dicalcium Phosphate	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100	100	100

Table 2: Proximate composition of experimental diet

Parameters (%)	T1	T2	T3	T4	T5	T6	T7
Dry matter	85.72	82.57	88.01	88.88	89.27	89.49	87.32
Crude protein	22.85	23.16	23.13	22.01	22.03	22.11	22.25
Crude fibre	2.61	2.30	3.18	3.64	3.03	3.16	3.83
Ether extract	0.71	0.58	1.19	1.81	3.12	0.96	1.07
Ash	9.81	7.86	8.81	10.19	8.99	9.13	11.52

*Values are representative of means of two independent analysis.

Results and Discussion

The result of performance of broiler chickens fed processed (roasted and soaked) UUADSM seeds are shown in Table 3. final weight, weight gain and feed intake were significantly different ($p>0.05$) while initial weight was not significantly different. The highest final weight and weight gain was recorded in T4 (15% RUADSM) and the weight gain was significantly the same as that observed in T7 (15% SUADSM). The feed intake had the highest value in T4 (15% RUADSM) and the least value was obtainable in T3 (12.5% RUADSM). Feed conversion ratio was not significantly different across the treatments. However, T4 had the lowest feed conversion ratio. T2 (10%RUADSM), T4

(15%RUADSM) and T7 (15%SUADSM) had comparable weight gain as the control treatment, the lowest weight gain was observed in T3 (12.5%RUADSM). Feed intake was highest in T4 (15%RUADSM) and also had the best feed conversion ratio. The result of this experiment is similar to Mwale et al 2008 who stated that inclusion of Baobab seed cake as a protein source in the diets of monogastric has no adverse effect. The report of this finding is in agreement with the findings of Bale *et al.*, 2013 who reported that feeding of baobab seed meal based diets up to 30% in broiler starter had no significant effect on both feed intake, weight gain and feed conversion ratio. This report is not consistent with the findings of Mwale *et al.*, 2008 as the inclusion of

Baobab seed cake (BSC) beyond 10% in the diet of guinea fowl keets brought about a decline in feed consumption and conservation rate and also the report of Chimvurahwe *et al.*, 2011 who also reported a decline in both feed intake and weight gain in broiler chickens fed *Adansonia*

(Baobab seed cake) at 5, 10 and 15% respectively compared to the control diet. The discrepancies in this report and that of Mwale *et al.*, 2008 and Chimvurahwe *et al.*, 2011 could be because of the processing methods (roasting and soaking) that was used in this experiment.

Table 3: Performance characteristics of broiler chickens fed roasted or soaked undecorticated *Adansonia digitata* seed meal based diets

Parameters	T1	T2	T3	T4	T5	T6	T7	SEM
Initial body wt	43.6	43.6	43.6	43.6	43.6	43.6	43.6	3.65
Final body wt	1382.1 ^d	1393.6 ^e	1043.6 ^a	1519.6 ^g	1118.6 ^c	1069.6 ^b	1493.6 ^f	27.32
Weight gain (g)	1338.5 ^{abc}	1350.0 ^{ab}	1000.0 ^c	1476.0 ^a	1075.0 ^{bc}	1026.0 ^{bc}	1450.0 ^a	3.89
Feed intake (g)	3087 ^f	3161 ^c	2871 ^g	3375 ^a	3114 ^e	3120 ^d	3370 ^b	0.05
FCR	2.32	2.38	2.85	2.30	2.96	3.16	2.33	0.24

*a,b,c means bearing different superscripts along the same row are significantly different ($p \leq 0.05$). SEM: standard error of mean FCR- Feed conversion ratio

Conclusion and Recommendation

Inclusion of processed *Adansonia digitata* seed meal up to 15% had no detrimental effects on the broiler chickens. Processing methods such as roasting and soaking can be employed in improving utilization of *Adansonia digitata* seed meal. It can be concluded from this experiment that roasted *Adansonia digitata* seed meal at 15% had optimum performance and can therefore be recommended as a means of processing *Adansonia digitata* seeds before its inclusion in broiler diets. It is recommended that further research can adopt other processing methods asides roasting and soaking in mitigating the effects of antinutritional factors present in *Adansonia digitata* seed meal in order to improve its utilization in broiler diets.

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